237

GAS JOURNAL

LIGHT . HEAT . POWER . BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

Vol. 202. 85th Year. LONDON, MAY 3, 1933. No. 3650. Price 1s.

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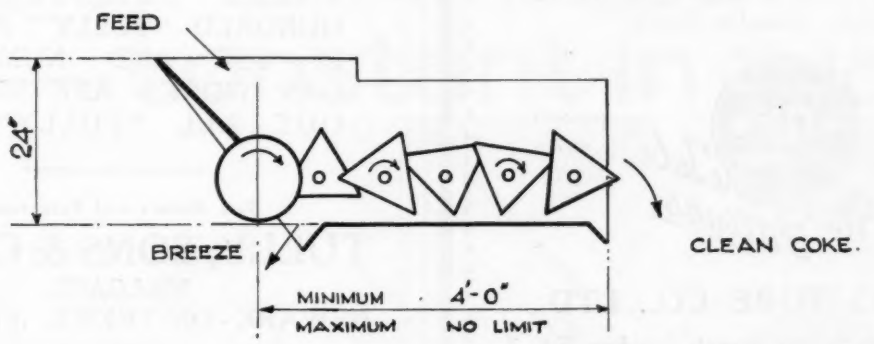

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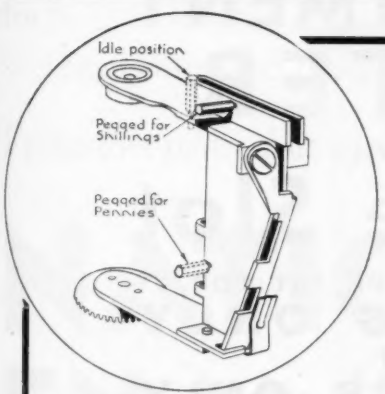

Illustration shows the coin pocket of a "Chelsea Two" Meter which normally takes both pennies and shillings. Note the simple screw peg which enables the Meter to be restricted to take pennies only or shillings only.

The Gas Meter which takes PENNIES *and* SHILLINGS

and can be easily restricted to take

PENNIES ONLY OR SHILLINGS ONLY

GEORGE GLOVER'S

"CHELSEA TWO"

GEORGE GLOVER & CO., LTD.

Dry Meter Manufacturers and Repairers

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THE IDEAL GAS SUITED TO ALL MODERN NEEDS

ECONOMICAL IN USE AND CHEAP TO PRODUCE

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Sole Makers and Patentees:

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OR
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BOTH SHILLINGS & PENNIES
AT OPTION OF UNDERTAKING.

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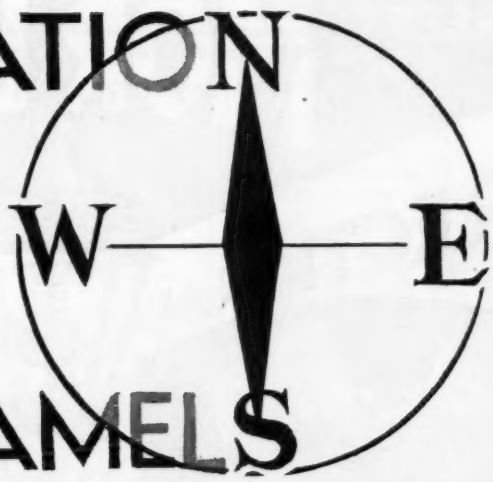

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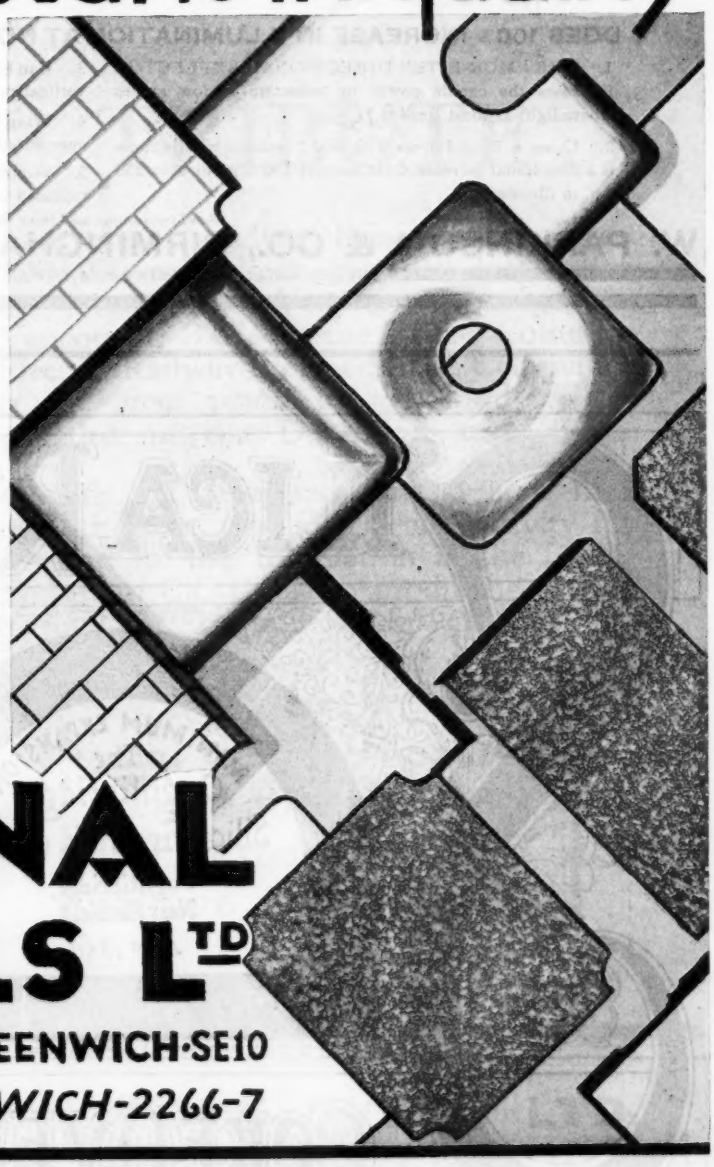
—constant in quality



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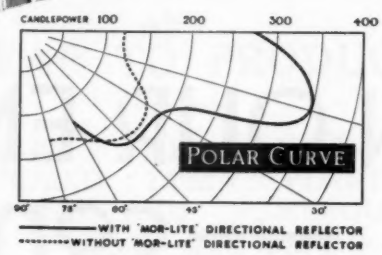

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Leaves Count
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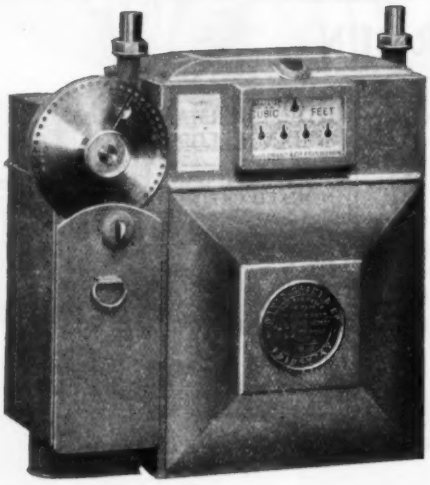

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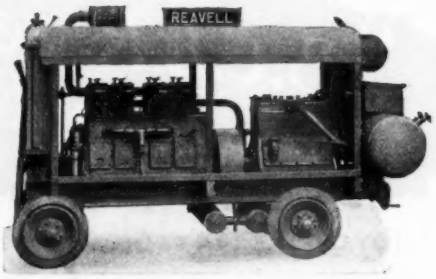

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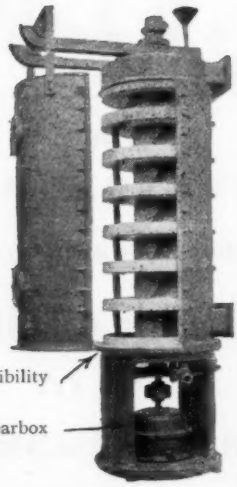

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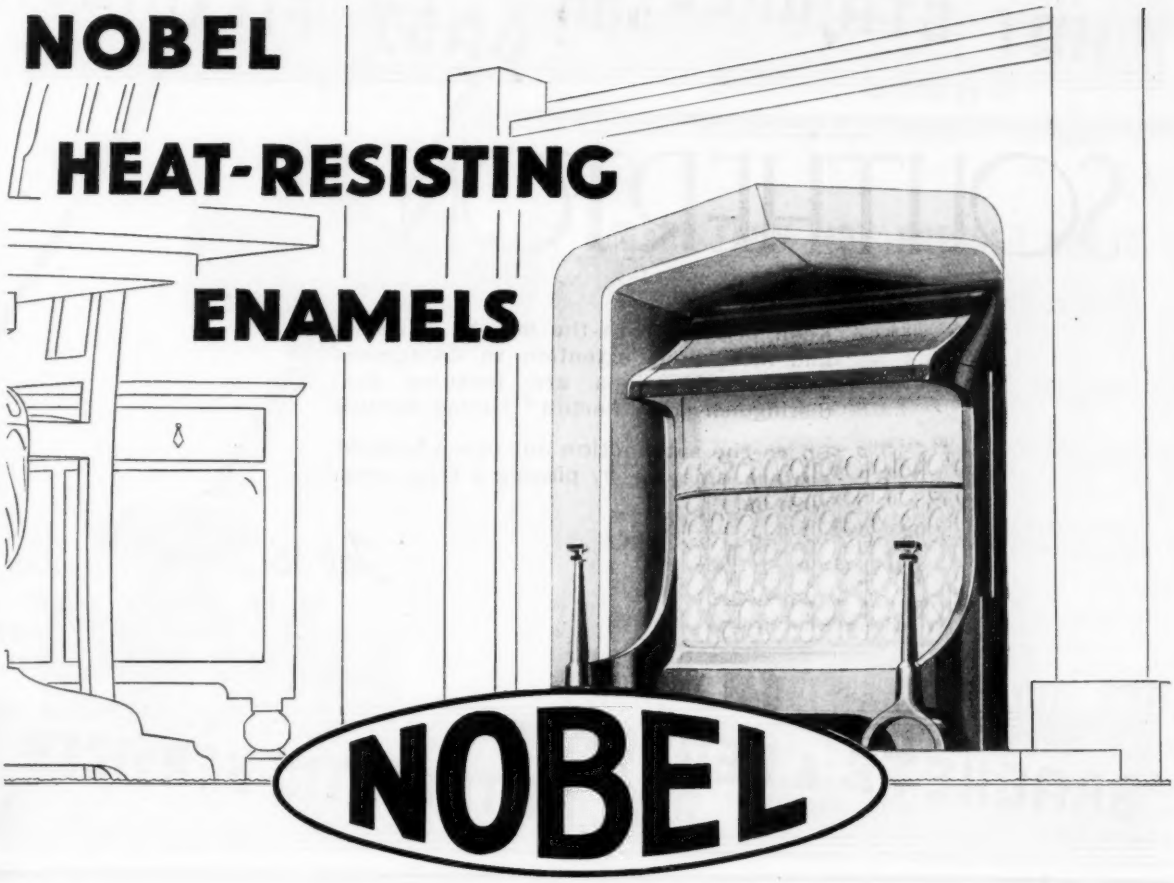

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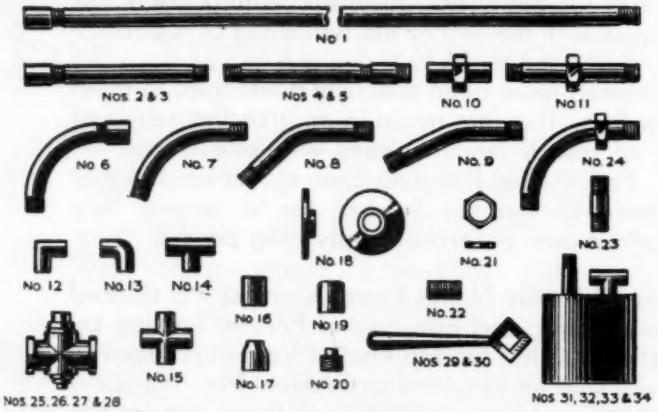

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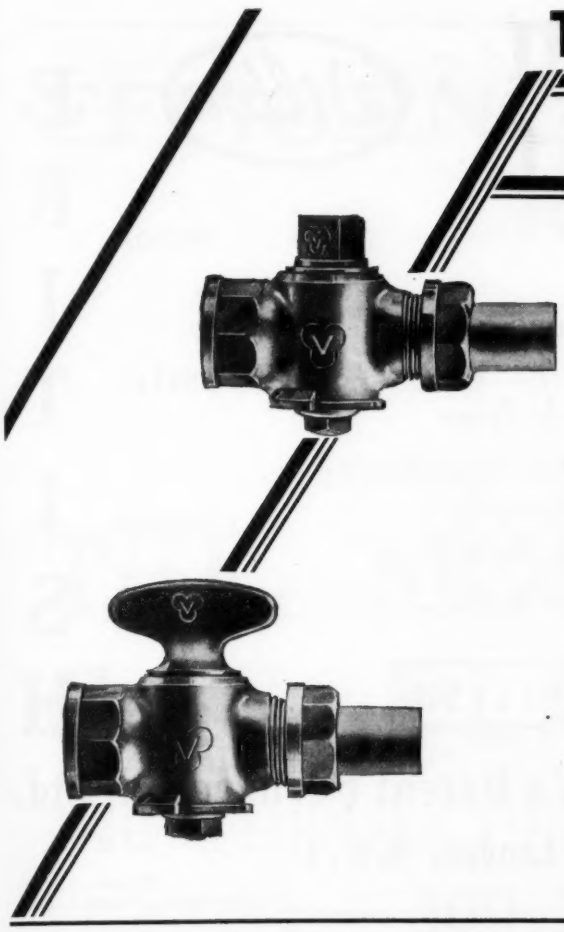

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BUT THEY HAVE SOLID PLUGS—FULL WAY, AND ARE ACTUALLY STRONGER.

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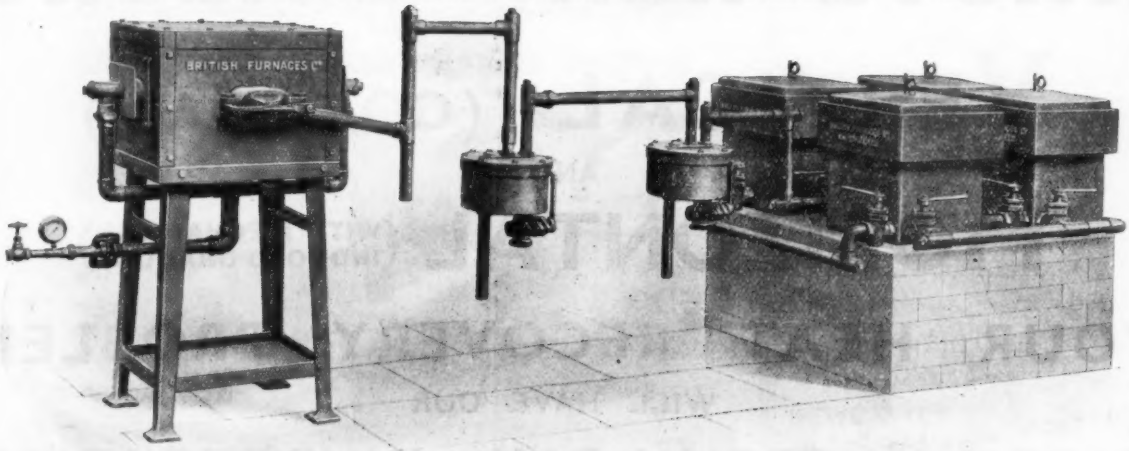

Lay-out of Coal Testing Plant, showing Surface Combustion Gas-fired Furnace, Livesey Washers, and Purifiers.

WE SHALL BE PLEASED TO QUOTE FOR THE COMPLETE PLANT, INCLUDING WASHERS, PURIFIERS AND HOLDER, OR FOR THE FURNACE AND RETORT ONLY.

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To improve your plant and increase your output at less cost

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THE MOORE GAS PLANT

140 THERMS PER TON QUALITY — 400 B.Th.U.

Mechanically operated
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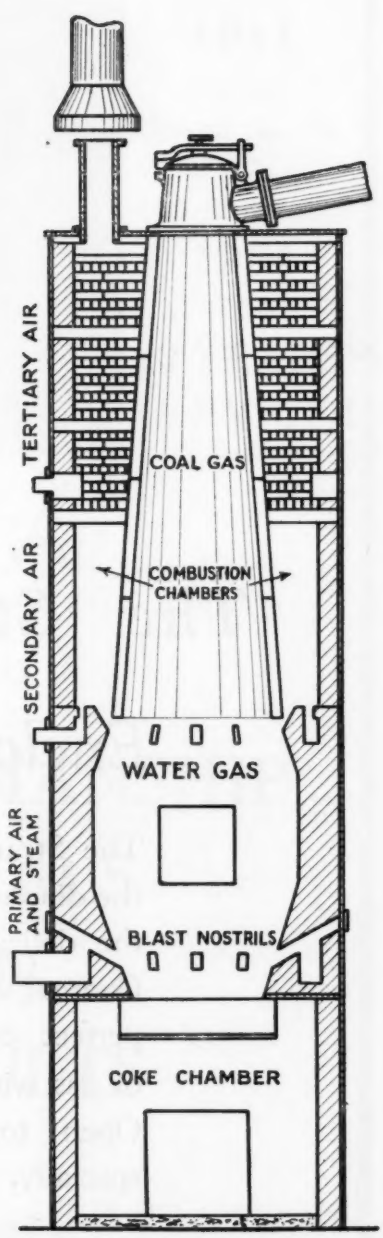

You need equipment which will operate efficiently at low cost.

The MOORE plant will increase the efficiency of your gas making and will reduce your depreciation and maintenance charges.

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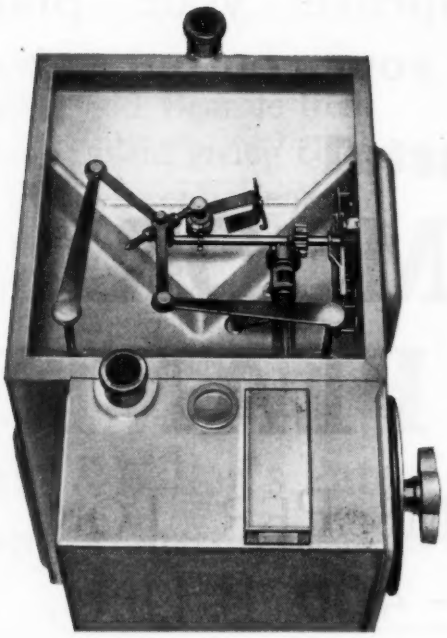

The top of the Straight Line Meter illustrating the additional safeguard of the enclosed valves, and the freedom of the gearing from gas.

The Straight Line Meter *with* Enclosed Top Valves

The Straight Line Meter relieves all strains on the diaphragm. The enclosed top valve protects the delicate parts from working in gas. Thus, George Wilson Gas Meters provide the only perfect combination for accurate registration of gas without constant attention to the meter. Open top meters are supplied, if ordered specially.

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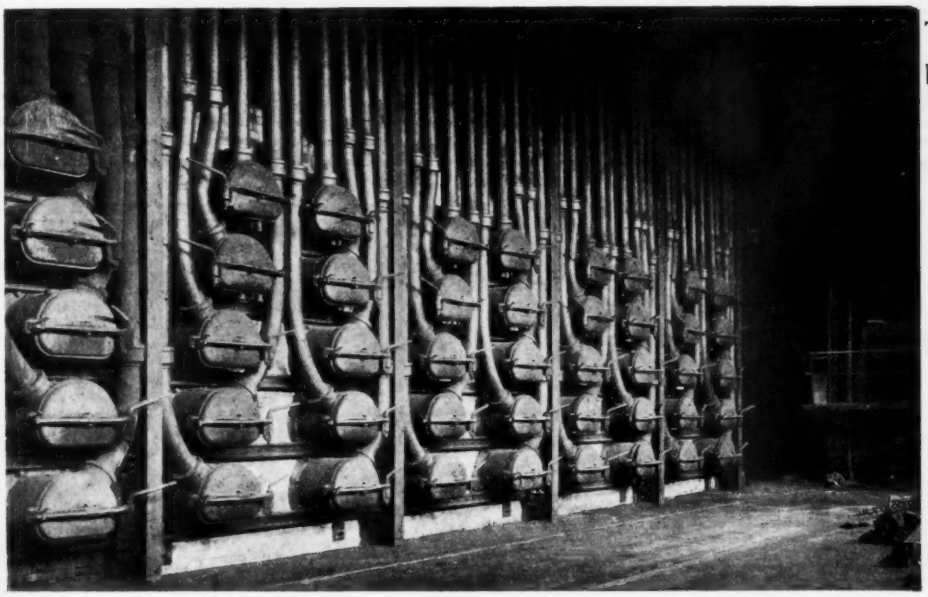
JENKINS HORIZONTALS



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NEW "Thompson"

BOILERS

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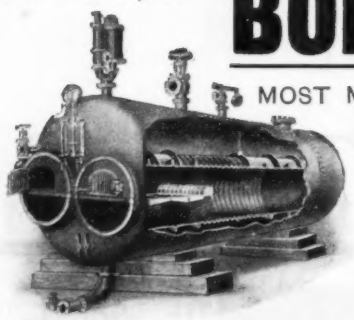

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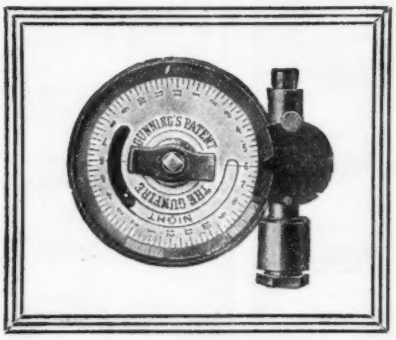

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CULWELL WORKS,
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PUMPS

Fig. 105

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Fig. 356

Fig. 367

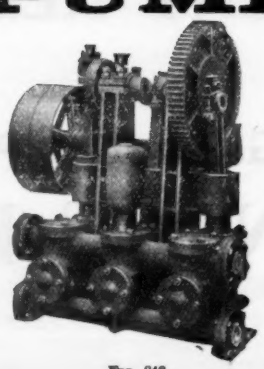

Fig. 849

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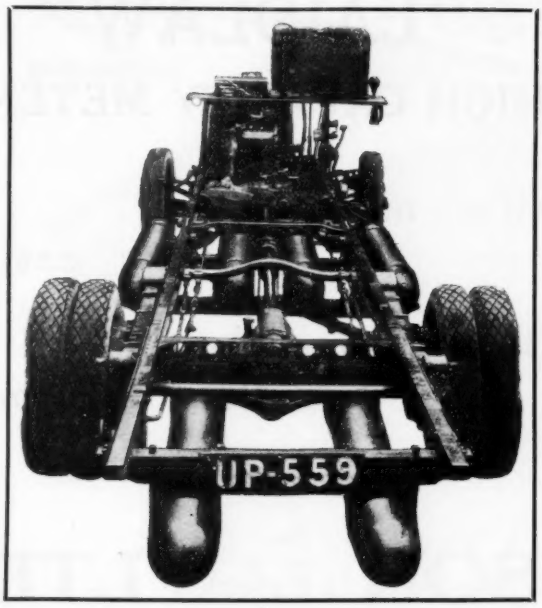
FOR
CATALOGUE No. 8.

Fig. 187

Fig. 69

Fig. 351

H.P. CYLINDERS FOR GAS DRIVEN VEHICLES.



Chassis of Bus showing arrangement of H.P. Cylinders.

CYLINDERS ARE SUPPLIED TO CONTAIN THE GAS REQUIRED BY THE VEHICLES AND ALSO FOR STORAGE AT THE COMPRESSOR STATIONS.

THE H.P. CYLINDERS SHOWN IN THE ILLUSTRATION WERE MANUFACTURED AT VICKERS-ARMSTRONGS' ELSWICK WORKS, NEWCASTLE-UPON-TYNE.

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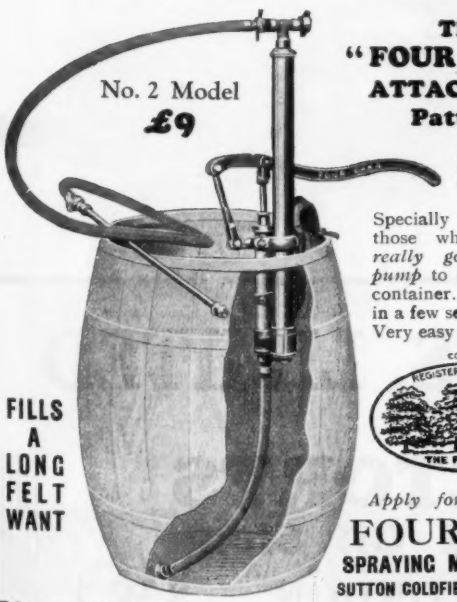

No. 2 Model
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The "FOUR OAKS" ATTACHABLE Pattern.

As supplied to many leading Gasworks.

Specially designed for those who require a *really good powerful pump* to fix to existing container. Can be fitted in a few seconds. Very easy working.

FILLS A LONG FELT WANT

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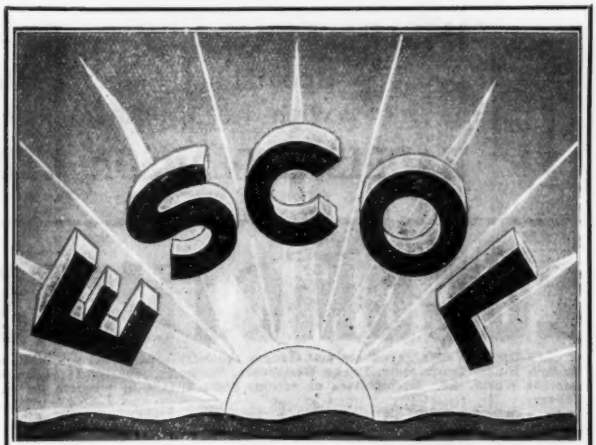

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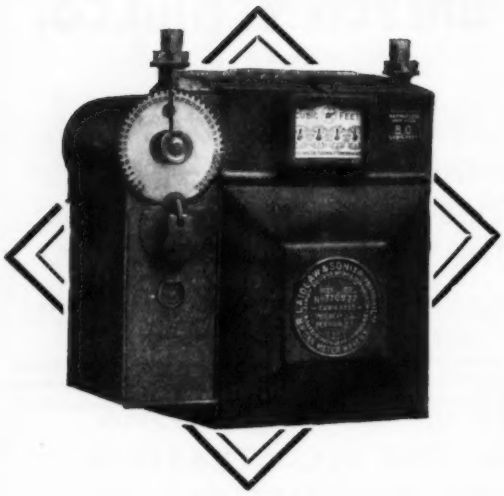

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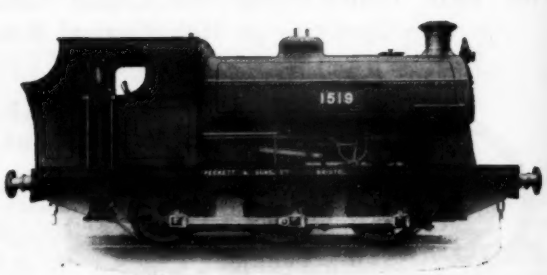

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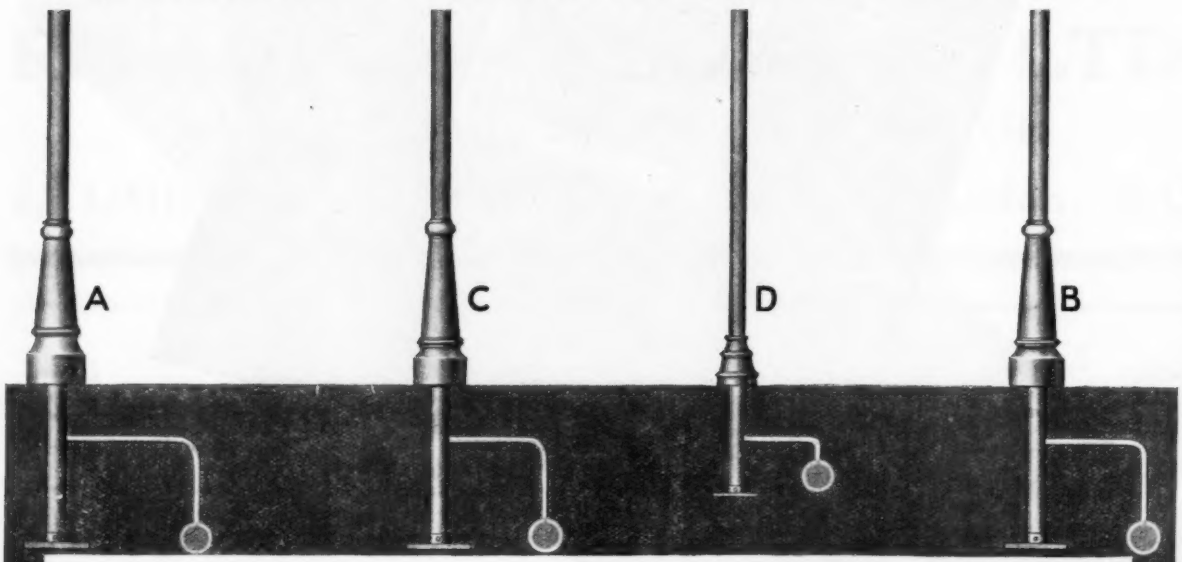

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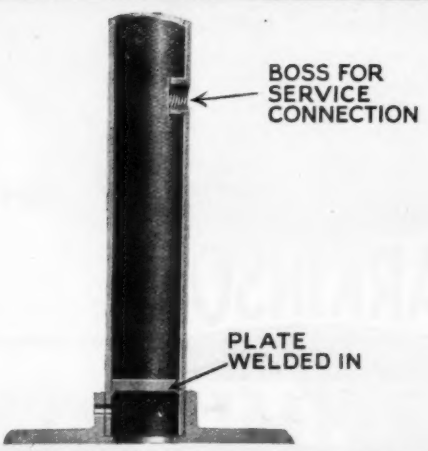

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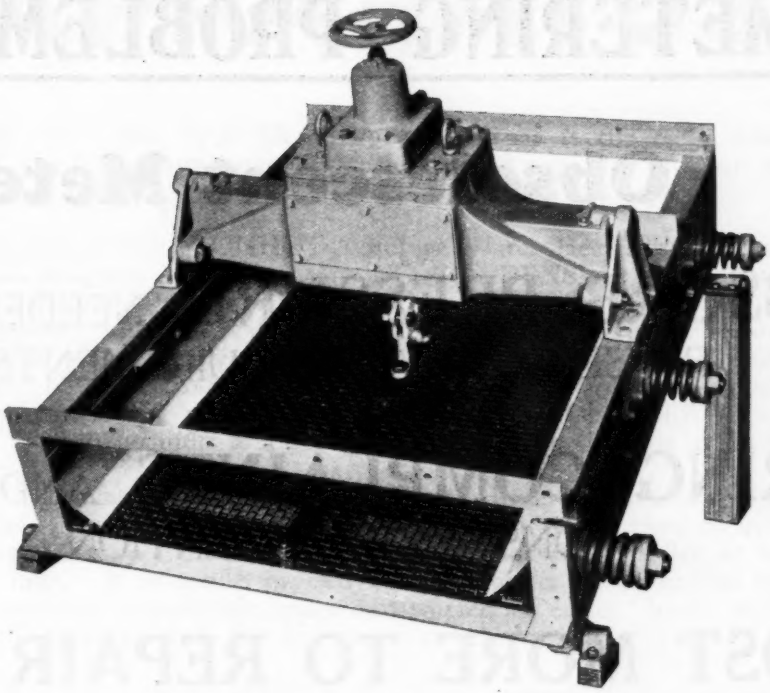

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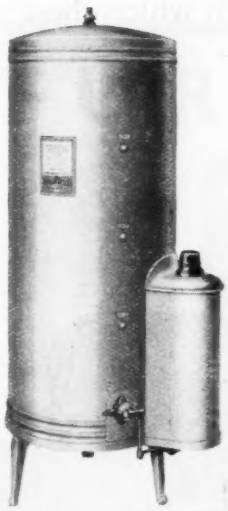

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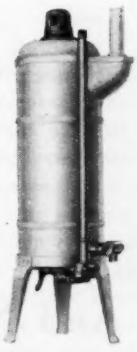

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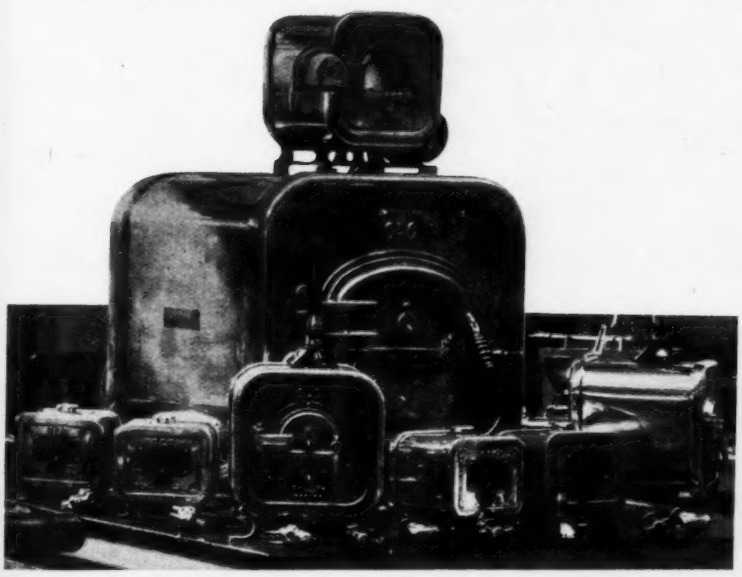
FURNACE CASING



Aluminium-cased furnaces and stoves at Selas Gas and Engineering Co.'s stand at the British Industries Fair, 1933, Birmingham.

The gas industry to-day supplies a large number of gas-fired furnaces which are used for such purposes as heat-treatment of metals, heating before stamping and so on. In many cases it is common practice to make the main external castings and casing of aluminium or aluminium alloy. Not only does this give a light, amply strong rustless structure, but in addition the low heat emissivity of polished metal gives more efficient working. Where sheet aluminium cannot be used, the finishing of the furnace with aluminium paint will give high reflectivity and a minimum of heat loss. This adoption has been very considerably extended recently, and soldering stove hoods are also often produced in the light metal.

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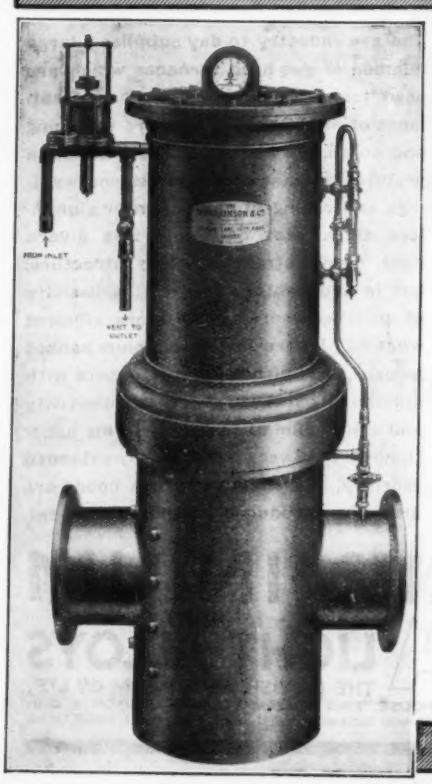

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THE GAS JOURNAL

MAY 3, 1933

Vol. 202. 85th Year No. 3650

A Glance at the Contents—

Long-Distance Transmission in Germany.

A contribution to-day outlines the methods and plant adopted in the long-distance distribution of gas in Germany. [p. 271.]

Wales and Monmouthshire Junior Association.

The Annual Meeting of this Association was held at Newport on April 22. The new President for 1933-34 is Mr. H. S. Bartlett, of Cardiff. [p. 287.]

Gas in the Pottery Industry.

The use of gas for pottery firing was the subject of an interesting address by Mr. A. Mackay, Chief Engineer and General Manager of the Stoke Gas Department, at a meeting of the National Council of the Pottery Industry. [p. 277.]

Construction of a 3-Million Spiral Holder.

In a paper before the Midland Junior Gas Association on April 6, Mr. W. T. Hobson, of Wolverhampton, gave some interesting details relative to the construction and erection of a 3-million c.ft. capacity spiral-guided gasholder in a steel tank. [p. 284.]

Selling Gas.

Modern selling, states Mr. A. Vivian Meldrum, in a paper at the Sixth Convention of the Australian Gas Institute, is based on well-known principles, and it is by applying some of these in their entirety and adapting others to suit the special needs of the undertaking that an efficient selling scheme can be evolved. [p. 280.]

Commercial and Industrial Salesman.

A Gas Company in the South-West of England is inviting applications for the post of Senior Assistant for Commercial and Industrial Sales. [p. 293.]

Working Manager Required.

It will be seen from our advertisement columns that applications are invited for the position of Working Manager of a small gas-works in the Midlands. [p. 293.]

The Practice of Rationalization.

Under an efficient scheme of rationalization the manufacture of gas would be concentrated in large stations, said Mr. H. Wadsworth, of Harrogate, in a paper before the Yorkshire Junior Gas Association on April 22. [p. 281.]

C.O.L. Chamber Ovens at Vancouver.

A description is given to-day of Vancouver's new carbonizing plant, which consists of C.O.L. chamber ovens embodying a number of special features, among which are multiplé combustion flues extending to about one-third the height of the chamber wall. [p. 278.]

Ash in Gas Coke.

In an interesting contribution on this subject, Dr. G. E. Foxwell submits that the ash content of coke, and of the coal from which it is made, depends on many factors and cannot be easily dismissed in terms of Dr. Lessing's calculation regarding the cost of ash to the community. [p. 276.]

Forthcoming Engagements

May 5.—NORTH OF ENGLAND ASSOCIATION.—Annual Meeting, County Hotel, Newcastle, at 2 o'clock.

May 5.—N.G.C.—Annual Meeting of District Executive Board for Scotland, N.B. Station Hotel, Edinburgh.

May 5.—FEDERATION OF GAS EMPLOYERS (SCOTLAND).—Annual Meeting, N.B. Station Hotel, Edinburgh.

May 5.—LONDON AND SOUTHERN JUNIOR ASSOCIATION.—Annual Business Meeting.

May 6.—I.G.E.—Written Examinations in Gas Supply.

May 6.—MANCHESTER DISTRICT JUNIOR ASSOCIATION.—Visit to Runcorn Gas-Works. Paper by Messrs. H. Goodier and W. E. Saunders.

May 9.—I.G.E.—Meetings of Finance Sub-Committee, 9.30 a.m.; Finance Committee, 10 a.m.; Executive Committee of the Council, 10.30 a.m.; Council, 2.30 p.m.; Gas Education Executive Committee, 4 p.m.

May 9.—NATIONAL JOINT INDUSTRIAL COUNCIL FOR THE GAS INDUSTRY.—Annual Meeting, 28, Grosvenor Gardens, S.W. 1., 12 noon.

May 10.—N.G.C.—Meeting of Central Executive Board, Hotel Metropole, London, W.C. 2, 11.30 a.m.

May 10.—I.G.E.—Meeting of Gasholder Sub-Committee, 9.30 a.m.

May 10.—N.G.C.—Annual Meeting, Hotel Metropole, London, 2.30 p.m.

May 10.—FEDERATION OF GAS EMPLOYERS.—Meeting of Central Committee, Hotel Metropole, London, W.C. 2, 11 a.m.

May 10.—FEDERATION OF GAS EMPLOYERS.—Annual Meeting, Hotel Metropole, London, 3.15 p.m.

May 11.—S.B.G.I.—Meeting of Council, 10.30 a.m.

May 11.—SOCIETY OF BRITISH GAS INDUSTRIES.—Annual General Meeting and Dinner, Hotel Metropole, London.

May 11-12.—EASTERN COUNTIES ASSOCIATION.—Half-Yearly Meeting at Croydon.

May 13.—SCOTTISH JUNIOR GAS ASSOCIATION (EASTERN DISTRICT).—Annual General Meeting at Edinburgh.

May 16.—I.G.E.—Meeting of Gas Appliances Sub-Committee, 2.30 p.m.

May 17.—B.C.G.A.—Meetings of Executive Committee, 11 a.m.; General Committee, 2.30 p.m., 28, Grosvenor Gardens, S.W. 1.

May 18.—WALES AND MONMOUTHSHIRE ASSOCIATION.—Meeting at Abertillery.

May 19.—SOUTHERN ASSOCIATION.—Meeting at Bridgwater.

May 19.—MANCHESTER DISTRICT ASSOCIATION.—Special Meeting at Leeds.

May 20.—YORKSHIRE JUNIOR ASSOCIATION.—Meeting at Leeds. Paper by Mr. W. E. Benton.

May 25.—MIDLAND ASSOCIATION. — Spring meeting at Stafford.

May 29.—I.G.E.—Meetings of Finance Sub-Committee, 2 p.m.; Finance Committee, 2.30 p.m.; Executive Committee of the Council, 3 p.m.; Council, 4 p.m., Liverpool.

May 30-June 2.—I.G.E.—Annual General Meeting, Liverpool.

EDITORIAL NOTES

Leak Detection

A MOST interesting method of detecting leakage of gas from mains and services has been developed in America, and was described by Mr. O. L. Smith at the Annual Distribution Conference of the American Gas Association last month. In leakage survey work about three-quarters of the cost is taken up in locating leaks, and it cannot be said that the bar testing metnod is rapid; it also has other disadvantages. The new system aims at eliminating most of this " preliminary " expense. The principle of the new method (the " Soundograph ") is to locate leaks by the sound of the leak set up on the interior of the pipe. This sound excites a small section of the line, and the position of the leak is determined by measuring the intensity of the sound at various points on the line, such as service connections at meter risers, drips, and so on. The " Soundograph " is a three-stage power amplifier designed for dry battery operation, and four types of microphonic sounding units—one for low-pressure work, one for intermediate and high-pressure work, one for the tape carriage for insertion into the mains, and one sounding rod for high-pressure distribution lines.

There are several methods of employing this new device. One is to tap the main, and screw-in a stuffing box. A steel tape with microphonic sound head is threaded through the stuffing box, and the sounding unit is pushed forward by the tape until a leak is heard. A " fader " arrangement is then used to determine the exact position of the leak. The tape is marked in feet, so that the operator knows just how far the leak is along the main from the point of sounding. The length of the tape is 300 ft., so that from one position it is possible to test 600 ft. of main—300 ft. in each direction. If the tapping is made at the intersection of mains, then, of course, it is possible to sound out 1200 ft.

Efficient Distribution

THE Harrogate Gas Company is responsible for the supply of gas to many rural communities scattered throughout an area of 193 square miles; and had it not been for the enterprise and far-sightedness of the Company hundreds of people who are now *contented* gas consumers would have been users of electricity. We lay stress on the word contented, because the rural gas service, though necessarily a little more expensive than that in the urban districts, is just as efficient. There is uniformity of calorific value and of pressure; there is equality of attention to consumers' requirements; there is similar skilled staff. The Harrogate Gas Company is, in fact, an admirable example of wise rationalization. In each of the districts taken over the price of gas has been reduced and the quality of service enhanced. In parishes where formerly there was no gas the Company is doing good business, despite the fact that electricity was first in the field; and the future prospects for the application of gas to such purposes as dairy farming are good.

In a paper before the Yorkshire Junior Gas Association Mr. H. Wadsworth, now with the Harrogate Company and formerly Manager at Knaresborough, one of the undertakings taken over, described the measures which have been taken to afford an adequate supply of gas throughout its area. High-pressure mains are employed for feeding the outlying districts, and the " compressing economy " is an impressive feature of the system's design. Full use is made of the existing holders at the various works; and though the high-pressure system was designed on the assumption that no holders were available, so as to allow a safe margin for eventualities, actually the use of the holders enables a much lower pressure to be carried in the mains than would otherwise be necessary. The supply into each holder is automatically controlled, and the holders continue to supply their respective districts exactly as before gas-making ceased. Most interesting, perhaps, is the installation of high-pressure static holders at one of the Stations. These holders do not function over the 24 hours, as does the normal holder, but they take the peak load on their own high-pressure system. Also, as Mr. Wadsworth explains, if it were necessary for any reason to isolate a section of the high-pressure main, the supply could be maintained to both sides of the isolated section. As five villages are supplied direct through governors and without storage, the importance of this arrangement will be realized. The high-pressure static containers, which act as a balance-weight, are filled approximately twice a week at periods of low consumption and, by a suitable arrangement of the connections and governors, discharge back into the high-pressure main when the pressure in that main falls below 2 lbs. per sq. in.; so what happens is that the containers are to the high-pressure system what a holder is to the low-pressure system, with the exception that they only function for short periods each day to meet the peak demands. The plant is automatic in operation apart from the filling.

The Harrogate high-pressure distribution system is certainly efficient, and systematic inspection is given to all apparatus on the system. Proof of this is afforded in the remarks of the author that there has been no failure on any part of the extensive system, giving a supply of gas to some 5000 consumers in the outer areas, apart from a governor occasionally blowing out the safety vent due to foreign matter getting on the valve seating. During the heavy snowstorm of February last, when portions of the district were temporarily isolated, no part of the equipment failed to function. Mr. Wadsworth's practical contribution gave rise to a useful discussion, and a report of both the paper and discussion is published in our columns to-day. We thoroughly agree with him that, if we are successfully to forward our business no effort must be spared to raise the efficiency of distribution, as distinct from the manufacture, of gas. Every consumer ought to be certain of a supply of gas at constant and adequate pressure.

A Central Gas-Works

AN article on later pages gives our readers an idea of the newly erected central gas-making plant at Magdeburg, and the excellent illustrations are impressive of the fine planning and architectural features of the works. When the mining interests in Germany put forward their plan to supply the whole of Germany from one enormous plant in the Ruhr district, there was naturally more than a little opposition, not only from private interests, but also on national grounds. Regarding the latter, the main objection was that the whole nation would be dependent on a single generating plant exposed to the risk of foreign invasion as well as of strikes. The outcome of the discussions between the leading gas authorities in Germany was the selection of a site for a central gas-works in the heart of the manufacturing area of Central Germany. The site at Magdeburg is certainly a good one. It is at the junction of the Mittleland Canal—one of the most important artificial waterways in the country

—and the River Elbe. Coal supplies can be brought to the works either overland or by cheap water transport, and the Elbe opens the way to the international market. Railway and river approaches, and inward and outward traffic, are set opposite each other, thus obviating the inconvenience of cross-traffic on the works, and the site provides ample room for sidings and for future extensions.

The gas-making plant consists of a battery of two units of 30 coke ovens of the under-burner compound type designed for heating either by the gas made in the process or by producer gas. Thus the plant is flexible in regard to the state of the coke market and to variation in gas requirements. The capacity of the plant is calculated on the basis of a yearly consumption of 400,000 tons of coal. If the ovens are heated by gas made in the process, the gas output will be 2300 million c.ft., while if producer gas is employed for heating the output will be 3530 millions. Compared with the output of the Gas Light and Coke Company (52,899 million c.ft.) or even of the Company's coke oven plant at Beckton (5475 millions), the Magdeburg plant is small, but there are, apart from the "grid interests," only three larger gas-works in Germany—Berlin, Hamborn, and Hamburg.

Progress of the Electricity Grid

"Who would want to live by the side of a steel pylon, and under electric cables?" This was an interrogation, during the course of an interview, by a Westcliff boarding-house proprietor, who had been summoned for non-payment of titnes on land at Rayleigh. So far as he himself was concerned, he laboured under a sense of grievance; but whether or not there was justification for this feeling, his query would be likely to evoke only one answer. The propinquity of pylons and electric cables may become a matter to be taken into consideration by house agents and builders, as the extent of these networks becomes impressed upon the public mind.

Something of the magnitude of the subject is to be gleaned from the Fifth Annual Report of the Central Electricity Board, which covers the calendar year 1932. From this it appears that the grid comprises approximately 3000 miles of primary transmission lines operated at 132,000 volts, linking up selected stations with one another and with the systems of other authorized undertakers in the areas, and inter-connecting the areas themselves. In addition to the primary transmission system, there are approximately 1000 miles of secondary lines operated at 66,000 or lower voltages. It was eventually deemed expedient that these secondary lines should form part of the grid, so that development could be accelerated in areas in which electricity has not hitherto been available. By the end of the year, all the wayleaves necessary for the erection both of the primary and of the secondary lines had been obtained except for a few miles mainly in the New Forest area. Since this work commenced in the autumn of 1927, the Board have had to negotiate with more than 21,000 owners and occupiers of land, and it has been necessary to seek compulsory wayleaves in less than 600 cases. The report goes on to state that construction of the lines advanced almost as rapidly as in the previous year, more than 1350 miles of towers having been erected in the course of the year. Of the entire transmission system of approximately 4000 miles, inclusive of cables, only 212·5 miles of towers and 3·5 miles of cables have still to be completed.

Wayleave difficulties have made it necessary in one or two instances to carry more than the customary maximum of two circuits on each tower. Two examples of this arrangement are the three circuits on the section of the primary transmission lines approaching Exeter, and the multiple circuit, 66,000 volt construction, used in North-East England for the approach to Dunston generating station. The latter consists of ten circuits carried on two pairs of gantries, each pair accommodating fifteen conductors and two earth wires. Seven circuits are part of the grid, and three are part of the system of the North-Eastern Electric Supply Company. Other notable multiple circuit arrangements are the Roding Crossing at Barking Creek, which has four circuits, and the crossing of the River Yare near Yarmouth with three circuits. Between Romsey and Nursling, near Southampton, there is a section of secondary lines in which two double circuit lines, one to Salisbury and the other to Winchester, are carried on one set of towers.

The primary transmission lines in the South-East and East of England include eight river-crossing towers, varying from the 159 ft. towers at Peterborough, for the crossing of the River Nene, to the 236 ft. and 245 ft. towers at Yarmouth, for the crossing of the Yare, the Roding tower at Barking Creek, 362 ft. high, and the Thames towers at Dagenham and Woolwich. The Thames towers (487 ft. high) were completed during the year. At the request of the Air Ministry, each tower is lighted by means of Neon red crosses located at points one-third and two-thirds of the height on each side, except the river side of the tower. The apex of each tower is also equipped with lights. The entire illumination, including that on the anchor towers, is approximately 20,000 candle-power.

It appears that the cost of constructing the grid is now ascertainable within narrow limits, although some small degree of estimating is still necessary in respect of works not yet completed, and works completed but not yet certified. The cost will amount to about £26,700,000. Bearing in mind the fact that the schemes, as adopted by the Board, differed in some important respects from those prepared by the Commissioners, and also the fact that, as the work proceeded, the Board have provided, or made provision for, additional circuits and transforming capacity likely to be required in the near future, and have deferred the construction of some works pending the growth of load, the cost will come out within 2½% in excess of the estimates of the Electricity Commissioners, "despite substantial expenditure on experimental lengths of 132,000 volt cable, and on the deviation of lines and undergrounding of some sections of secondary lines for the preservation of amenities."

What of the Budget?

The Budget this year has created so little stir that an unobservant man might have overlooked it altogether. Why is that? The times are momentous; industry remains grievously depressed. The gains of an enterprising policy might well be fabulous; the results of a "nothing venture" policy may equally well prove disastrous. The first needs for setting the financial course of the good Ship of State for another year seemed to be both length and breadth of vision; and we should have welcomed demonstrative evidence of recognition by Parliament and people that the course decided upon was likely to steer the Ship to calmer waters.

Instead, *The Times* tells us that "the Budget debates this year will pass into history, or more probably into oblivion, as the most apathetic of modern times." There were proposals for putting a duty of 1d. per gallon on heavy oils, and for increasing the duties upon the heavier class of road vehicles; and then, of course, there is beer, which has been more fortunate. Like the surtax yield, which has proved "depressingly low," the revenue from the beer duty has been "seriously undermined." In regard to the latter, the Chancellor of the Exchequer said: "I cannot afford to wait any longer before taking some measure to safeguard the revenue of the future." So changes have been made to enable the supply of beer to be both better and cheaper. But it seems we have not yet reached the stage—it cannot be far off—when it is impossible to wait longer before taking measures to safeguard the revenue of the future in regard to income-tax.

Does the income side of the national accounts receive more than its due share of attention, to the detriment of the expenditure side? If so, it is a pity; for the income side does not appear to provide any solution of the problem of how to lighten the burden of taxation, which is standing in the way of an early return to prosperity.

PERSONAL

Mr. T. R. Cook, Blackpool's Gas Engineer and Manager, who recently underwent an operation in a nursing home, is home again, and is making satisfactory progress.

* * *

His many friends in the Gas Industry will be pleased to learn that Mr. Richard A. E. Starkey, associated for a number of years with Messrs. Humphreys & Glasgow, Ltd., has joined the staff of the "Gas Journal" and the "Gas Salesman."

OBITUARY

Mr. Harry Julyan Donkin died on Tuesday of last week at Worthing, where he had been recently staying for his health. He was in his 76th year and had been associated with the Bryan Donkin Company, Ltd., the whole of his life. He was the grandson of the Bryan Donkin who founded the Company in 1803. Deceased was widely respected in the Gas Industry, in which he had numerous friends, especially among the leading men in the Industry. He was a very sound Engineer, and a man whose advice was frequently sought and was readily given. He partially retired from active interest in the Company some four or five years ago, but kept in touch with many of his old friends. He will be greatly missed by the Company and by his many friends.

* * *

The death occurred on April 28, in his eightieth year, of Sir John Hunt, who had been Chairman of the York Gas Company since the death of Mr. Alfred Procter in February last. In the New Year's Honours List, 1931, Sir John was knighted for his "public services and benefactions in the East Riding."

THE NEWS OF THE WEEK

The Zurich Gas Department is inviting tenders until May 29 for the construction of a new gasholder at the Schlieren Works.

"**Kitchencraft**" **Demonstrations** are being held from May 1 to May 13 at Fenwicks, of Northumberland Street, Newcastle, in co-operation with the Newcastle-upon-Tyne and Gateshead Gas Company. Cookery demonstrations are given twice daily, including "automatic" cooking in controlled oven. Qualified lady demonstrators are in attendance to give helpful advice to individual inquirers.

A Display of Clinical Gas Lamps was recently staged by the Leamington Priors Gas Company in their Regent Street Showrooms. Clinical gas lamps of this pattern on standards are being used with satisfaction by Mr. W. J. Leist and his staff at the Leamington Pump Rooms and at the Warneford Hospital, as well as by several local doctors and householders, and in order to make them better known arrangements were made for a practical demonstrator to be in attendance at the Gas Showrooms to point out how the lamp can be used for home treatment.

Contract for Gasholder.—At the Annual Meeting of the Penzance Gas Company, of which Mr. J. W. Buckley, M.Inst.C.E. (late Chief Engineer of the Hornsey Gas Company), is now the Chairman, it was decided to place a contract with Messrs. Willey & Co., Ltd., Exeter, for a steel tank and 3-lift spiral gasholder to contain 250,000 c.ft. of gas. The contract includes foundations resting on specially constructed concrete piling. Mr. J. W. Buckley has been associated with the Penzance Gas Company for the past 35 years and has acted as Consulting Engineer for the greater part of that period.

Junior Institution of Engineers.

49th Anniversary Dinner.

Prof. C. H. Lander, C.B.E., of the Engineering Department of the Imperial College of Science, London, was among the distinguished guests who attended the 49th anniversary dinner of the Junior Institution of Engineers, founded June 30, 1884.

The President, Sir Alexander Gibb, G.B.E., C.B., occupied the chair, and was supported by the surviving founder of the Institution, Mr. Walter T. Dunn, M.I.Mech.E., former Secretary to the Institution of Gas Engineers; Sir Murdoch Macdonald, K.C.M.G., C.B., M.P., President of the Institution of Civil Engineers; Mr. Alan E. L. Chorlton, C.B.E., M.P., President of the Institution of Mechanical Engineers; Prof. E. W. Marchant, D.Sc., President of the Institution of Electrical Engineers; Dr. Standen L. Pearce, C.B.E., Sir Richard Redmayne, K.C.B., M.Sc.; Prof. E. G. Coker, M.A., D.Sc., F.R.S. (Hon. Mem., Jun. Inst. E.); Col. William McLellan, C.B.E.; Mr. W. A. Tookey, President of the Institution of Automobile Engineers (Vice-Pres., Jun. Inst. E.). There was a numerous attendance of members of the Institution, filling the large dining hall of the Hotel Metropole, London.

After the Loyal Toast had been honoured, Sir Murdoch Macdonald proposed that of "The Junior Institution of Engineers," which was acknowledged by Mr. Ernest Ambrose, M.I.E.E., as Chairman of the Institution. Allusion was made to the circumstance of the celebration of the Jubilee next year, and to the position which the Institution has attained through its years of activity. "Civil Engineering" was in the hands of Sir Richard Redmayne, who spoke of the part that science had played in the lives of the great engineers such as George Stephenson, Murdoch, and Trevithick.

The response to the toast was by Sir Alexander Gibb. Mr. Horace P. Wright then gave the toast of "Our Guests," to which Mr. Chorlton replied.

Institution of Gas Engineers.

Members of the Institution are invited to attend the Annual General Meeting of the Illuminating Engineering Society at the Institution of Mechanical Engineers, Storey's Gate, St. James' Park, S.W. 1, on Tuesday, May 9.

Imperial Continental Gas Association.

The Directors of the Imperial Continental Gas Association submit their report upon the trading results of the Association for the 109th year of its commercial activity, ended March 31, 1933, which shows that the operations of the Association and its subsidiary and allied companies in Belgium, France, Holland, Germany, and Czecho-Slovakia continue to give satisfactory results.

The balance-sheet shows a reduction in the general and specific reserves of £482,019, which is principally due to certain readjustments in capital account, necessitated by the renewal of the concessions of the Antwerpsche Gasmaatschappij. Of the reserves, a sum of £79,000 has been earmarked as a specific provision for the loss sustained during the year by the Cokeries du Brabant. The subsidiary and allied companies have this year allocated to their reserves an aggregate sum which exceeds last year's allocation by a larger amount than the above provision of £79,000.

The audited statement of accounts for the twelve months to March 31, 1933, shows that the balance to the credit of the profit and loss account was £510.998, to which has to be added the balance brought forward of £483,353, making a total available for appropriation of £994,352. Out of

this balance there has been paid on the capital of £5,600,000 an interim dividend of 5%, less income-tax at 5s. in the £, absorbing £210,000, and the Directors now recommend: (*a*) The payment of a final dividend of 7%, less income-tax at 5s. in the £, making a total dividend equivalent to 12%, less tax, for the year; and (*b*) a profit-participating bonus to the staff amounting to £5040; leaving a balance to be carried forward of £485,312.

Under the By-laws of the Association, the Right Hon. Sir Guy D. A. Fleetwood Wilson, G.C.I.E., K.C.B., K.C.M.G., Sir George Jessel, Bt., M.C., and Mr. Michael Hubert Tetley, M.I.Mech.E., retire from the Board by rotation. These gentlemen, being eligible, offer themselves for re-election.

Society of British Gas Industries.

A Meeting of the Council was held at 56, Victoria Street, Westminster, S.W. 1, on April 20—Mr. E. J. Fox, the Chairman, presiding. Those present were: Dr. E. W. Smith, Messrs. Frank West, C. A. Goodall, John Orme, T. F. C. Potterton, Albert West, C. S. Bennett, G. Clark, L. Hartley, W. H. Handley, B. B. Walker, H. A. Hobson, H. E. Bennet (Vice-Chairman), F. J. Gould (Hon. Treasurer), E. J. Davison (Hon. Secretary), and Arthur L. Griffith (Secretary). Apologies for absence were reported from Messrs. D. W. Turner, H. M. Thornton, W. J. Gardner, and T. A. Clapham.

A contribution was voted to the funds of the British National Committee of the World Power Conference as last year.

Mr. Frank West was re-elected as the Society's representative on the British National Committee for the current year.

The following were elected members of the Society: New Geysers (1931), Ltd., London, Section 8; R. Russell & Sons, Ltd., Derby, Section 6.

It was decided that the Gas Industries Section at the British Industries Fair, Birmingham, be again organized for 1934 on similar lines as before.

The Society's representatives were re-elected on the Committee with the addition of the new members who will be Chairmen of the Sections in place of those retiring.

The arrangements for the Annual General Meeting and Dinner in London on May 11 were reported.

The Council's Report for 1932-33 was considered and approved.

Annual Meeting of Gas Salesmen.

In the course of his remarks in opening the proceedings at the Annual Meeting of Gas Salesmen in London on April 7, Mr. William Cash referred to the great opportunity for the development of the use of gas in non-industrial areas. In the "JOURNAL" for April 12 we reported him as having stated that in Bournemouth there was only one house in which there was electricity where gas was not used. Actually Mr. Cash was referring to the houses erected in 1932; of the total number of houses built in that year there was only one which was wired for electricity which was not also piped for gas.

Education for Commerce.

A Message from the Prince of Wales.

In connection with the meeting of the British Association for Commercial Education at the Mansion House, London, yesterday afternoon, under the Presidency of Lord Eustace Percy, M.P., a message was received from H.R.H. the Prince of Wales, who is a Patron of the Association.

I am glad to know, said the Prince in his message, that the British Association for Commercial Education, of which I am Patron, is launching a programme of active work at the Mansion House this afternoon and that they have for their object the furtherance of British trade through the improvement of the personnel employed in its conduct.

To-day, if ever, we need a high standard of efficiency in all ranks of commerce to enable us to compete successfully in the markets of the world; and upon our success depends in no small measure the solution of our tragic unemployment problem.

In wishing all success to your meeting and to the work of the Association, let me emphasize the need for close co-operation between those responsible for the conduct of our commercial enterprise and those directing all branches of education.

The value—the vital importance—to business of trained intelligence and of training for leadership, as well as for the rank and file, needs to be constantly remembered, and we can only secure this through complete co-operation.

Sir Francis Goodenough, C.B.E., is Chairman of the Council of the British Association for Commercial Education, and the objects of the meeting held yesterday were to further the cause of education for commerce as a means towards increased efficiency in the conduct of trade. Sir Josiah Stamp, G.B.E., gave an address, and the future programme of the Association was explained.

Southern Association.

An attractive programme has been arranged for the visit of the Southern Association of Gas Engineers and Managers to Bridgwater, the town of the President, Mr. J. Hughes Cornish, on Friday, May 19.

The works of the Bridgwater Gas Company in Old Taunton Road will be open to the members from 10 a.m. till 12.30 p.m. (Light refreshments will be provided by the Gas Company.) At 12.30 p.m. conveyances will leave the works for the Royal Clarence Hotel, where the members will be guests of the Chairman and Directors at luncheon at 12.45 p.m.

After luncheon at 2 o'clock, members will leave by motor coaches for a drive over the Quantock Hills, Brendon Hills, and Exmoor to Dunster, where the President and Mrs. Cornish invite the company to tea at the Luttrell Arms. The return journey will be made via Carhampton, Blue Anchor, St. Deenmans, Watchet, St. Audries, Holford, and Stowey, reaching Bridgwater at 7.30 p.m. The drive embraces some of the finest scenery in West Somerset, and the General Committee trusts that as many members as possible will take this opportunity of visiting Bridgwater and of enjoying the hospitality of the President and the Bridgwater Gas Company.

Ladies will be welcome, and they are invited by the Gas Company to the drive and also to luncheon at the Bristol Arms Hotel, High Street, at 12.45 p.m., where Mrs. Cornish, Senr., and Mrs. Cornish, Junr., will be pleased to receive them.

Centenary Celebrations at Morpeth.

The Morpeth Gas Light Company, Ltd., celebrated its centenary on Monday, April 24. The Company was constituted by trust deed on April 24, 1833, with a capital issue of £1200, divided into 120 shares. At the start the subscribers numbered 39, and from the records one subscriber made himself responsible for six shares, £60. With that small capital the Company erected plant and works and a cottage for the foreman workman (costing £41) at a total expenditure of £1193 6s. 5d., leaving only a little over £6 to carry on the undertaking. The capital of the Company is now £30,967, and during the past year the output of gas was 42 million c.ft., an indication that the Company has made remarkable progress, in spite of keen competition, for a small country town of 8000 inhabitants.

At an invitation dinner held in the Queen's Head Hotel, Morpeth, there was a representative company including the Mayor and members and officials of the Morpeth Corporation. Major Ralph Crawford, who has been Chairman of the Company for over 30 years, presided over the proceedings.

Mr. R. C. OLIVER (a Director), proposing the toast of the "Gas Industry," thought it said a great deal for the enterprise of their then townsmen of one hundred years ago that they were so early in the field with a gas supply. When they considered how isolated a small country town like Morpeth was a century ago, without railways or telegraphs, telephones or wireless, with stage coaches and lumbering wagons instead of the motor transport of to-day, it seemed remarkable that within twenty years of the introduction of gas Morpeth should have established a plant for its manufacture and distribution. Gas had been applied in innumerable ways undreamt of by the early pioneers, and to-day it stood an indispensable factor with ever-increasing usefulness and ever-increasing convenience in the life of the community.

Mr. A. C. HOVEY (President of the North of England Gas Managers' Association) responding, pointed out that, although the production of gas dated as far back as the 15th century, it really only became of practical utility at the beginning of last century, and within thirty years of its use in London it was available for the inhabitants of Morpeth. The Undertaking had continued to flourish in that town ever since. What they had to do was to work for efficiency in production and distribution.

"We have now an efficiency of production of from 80 to 85%," he emphasized, "and the production efficiency of electricity is nowhere near that. The best the electrician can do is 22 or 23%. It is evident that the Gas Industry has nothing to

THE NEWS—*continued.*

fear from electricity, provided it keeps the price of its gas below that of electricity."

Mr. F. P. TARRATT (Chief Engineer to the Newcastle-upon-Tyne and Gateshead Gas Company) and Mr. C. DRU DRURY (Chief Engineer to the Sunderland Gas Company) also responded.

A genuine tribute to the outstanding ability of Major Crawford, the Chairman of the Company, was paid by Mr. OLIVER. He said that Major Crawford had stepped into the breach at a time when the affairs of the Company were in great confusion, and with his knowledge of finance he straightened the whole thing out and put the Company upon the high road to success.

The MAYOR (Councillor R. W. Watson) proposed the toast of "The Morpeth Gas Light Company (1902), Ltd." As a Corporation they were proud of the Company's long record, he said, and more so because they were large shareholders. The Company was ever ready to help the town, and he thought they could boast of being one of the best-lighted towns, for its size, in the country. Their present lighting system was the same as was used on the sea front at Scarborough and other large towns, and was highly successful. He also paid tribute to the energy and enterprise of Mr. Richard Lockey, the Company's Secretary and Manager.

Major RALPH CRAWFORD, responding, referred to the happy relations that existed between the Corporation and his Company. He said that only once had the Company failed to pay a dividend, and that was in 1854, when it was decided to rebuild the works. The work of reconstruction lasted three months, and during that period no gas was manufactured. The first lighting of Morpeth was on Nov. 19, 1833, and on Nov. 19, this year, the Company would celebrate the auspicious event by giving an exhibition of floodlighting.

Eleventh List of Bookings for Film "Tar."

The following provisional bookings, subject to local variations and contingencies, have been arranged for three days' showing at each theatre, unless otherwise stated:

May 7.—Prince of Wales, Bedlington (1 day).
May 11.—Palace, Freshwater.
May 29.—Princess, Dundee.

New Scale of Charges at Bradford.

As from the dates of the meter readings for the half-year ending June 30, 1933, two alternative scales of charge will be available for the choice of each consumer at Bradford:

Alternative 1.—*Flat Rate of Charge.*

4s. 2d.* per 1000 c.ft. (10d. per therm) for all purposes, in whatever quantity, unless taken through prepayment meter, in which case the charge will remain unaltered at 4s. 4d.* per 1000 c.ft. The charges for hire of ordinary meters will remain unaltered. The minimum quantity charged will be 500 c.ft. per quarter year.

Alternative 2.—*Two-Part Rate of Charge.*

1s. 6d.* per 1000 c.ft. (3·6d. per therm) for all purposes, in whatever quantity, with additional fixed charges (which include meter hire) as follows:

	Per Quarter Year. £ s. d.
(*a*) On dwelling house having one living room only (*i.e.*, non-parlour type houses)	0 6 6
(*b*) On dwelling house having more than one living room (*i.e.*, parlour type and larger houses)	0 13 0
(*c*) All consumers not in classes (*a*) or (*b*) above—	
On each meter of 5 light (No. 1) or smaller size	0 13 0
On each meter over 5 light and up to and including 10 light (No. 3)	1 5 0
10 ,, ,, ,, 30 ,, (No. 4*a*)	2 0 0
30 ,, ,, ,, 80 ,, (No. 6*a*)	3 0 0
80 ,, ,, ,, 200 ,, (No. 10)	5 0 0
200 ,, ,, ,, 500 ,, (No. 12)	7 10 0
500 ,, ,, ,, 1000 ,,	12 10 0
1000 light—terms to be arranged.	

Flats, sublet rooms under one roof, &c., will be treated each as a separate dwelling. Houses combined with business premises, &c., will be charged in Class (*c*).

* In Wilsden and Denholme the figures of 4s. 2d., 4s. 4d., and 1s. 6d. are subject to an addition of 8d., and in Scholes, Oakenshaw, Shelf, Hunsworth, and Clifton to an addition of 10d.

All accounts will be rendered and payable at intervals of three months, and a discount of 5% will be allowed for prompt payment of all accounts (12½% to property owners responsible for tenants' accounts).

All consumers who desire to avail themselves of the two-part rate of charge will be asked to sign a memorandum to that effect, and to use a meter of sufficient size, in the opinion of the Gas Committee, to give an adequate supply to the appliances connected to it. An explanatory communication is being sent to each consumer.

"Electrician" Annual Tables of Electricity Undertakings.

Benn Bros., Ltd., have published the 46th Edition of this useful set of tables, at 10s. net (postage 9d. extra). All the usual well-known features have been retained, and in many cases considerably amplified, and the particulars supplied have been fully revised so that Tables "A," "B," and "C" (British Undertakings, Smaller British Undertakings, and British and Colonial Power Companies respectively) may be regarded as authoritative. There is a substantial number of new entries in Table "A," due to the grouping of certain Northern Undertakings into the North-Eastern Electric Supply Company, Ltd.

The matter of "frequency control" introduced last year is more fully dealt with, and this information, of great importance to manufacturers and users of synchronized appliances, has been provided in respect of a larger number of undertakings than heretofore.

A new and useful feature is the inclusion, where possible, of the address of the Head Office of the Undertaking in addition to that of the Showroom.

Sheffield Gas Company's Research Work.

During the visit of the Yorkshire Junior Gas Association to Sheffield, on April 22, the members of the Council of the Association were enabled to pay a visit of inspection to the Sheffield Gas Company's Research Laboratories, by invitation of the Directors and Mr. Ralph Halkett (General Manager).

This Department, Mr. Halkett explained, was developed especially for the purpose of demonstrating in a practical manner the value of town gas as an industrial fuel—a matter offering a particularly wide field of possibilities and extension in a place like Sheffield. The normal equipment of the furnace demonstration room includes standard types of furnace in everyday use in various trades of the district; and the ease and convenience with which gas can be used and controlled under the many different furnace conditions applicable to such industries is readily shown.

Customers and potential users of gas are invited to the Department, and their own particular heating operation is carried out in a practical manner, either in standard furnaces or, when necessary, in furnaces specially designed for the purpose by the Gas Company's staff. The quality of any material form of heat treatment can also be tested in the Department by means of the most up-to-date physical and micrographical apparatus installed for the purpose. Research work is also carried out to find new avenues for the use of gas, and development work for improving, where possible, existing systems of application. Recently-developed methods of temperature measurement and automatic control, and atmosphere control for ferrous and non-ferrous metals, are used; and furnaces complete with automatic temperature control are installed.

A New Laboratory Service.

The Directors of Combustion Engineering, Ltd., of Aldwych House, W.C. 2, announce that they have decided to place the firm's laboratory services at the disposal of all interested. The highly technical conditions which dominate the industrial world to-day make obvious the advantages of scientific control, and it is to that end that the laboratory services are offered.

Accordingly, a booklet has been issued by the Company, which gives a survey of the services which it is proposed to offer. The laboratories are adequately staffed and equipped for rapid and accurate service, and the methods of analysis used are those fully approved by the British Standards Institute, H.M. Fuel Research Board, and other official bodies. Combustion Engineering, Ltd., and their associated concerns have a remarkable record in connection with the supply of all types of combustion equipment to public and private enterprises all over the world. The experience thus acquired by the technical staffs in this work is now available for the solution of particular problems.

As an example of the work carried out by the laboratories, the booklet mentions that there may be a choice of coals, all very similar upon analysis, but giving vastly different results in practice. Their experience in combustion and carbonization is available to assist in making the best choice for particular conditions. Again, scale in boilers is costing more than may be initially realized, by reason of greatly diminished steam raising efficiency, deterioration of boiler metals, and the loss of time and the cost occasioned by the necessity for periodic de-scaling. As well-

known makers of modern high-pressure, high-rated boilers, the firm have of necessity had to overcome these troubles, and will be pleased similarly to assist others.

The firm are equipped to carry out high and low temperature carbonization tests, by approved methods, and are prepared to deal with solid, liquid, and gaseous fuels of all types. Those interested who desire further particulars, or who have any specific inquiry to make relative to this laboratory service, are invited to make application to: The Laboratories, Combustion Engineering, Ltd., Sinfin Lane, Derby ('phone, Derby 3191).

A New Cookery Book.

General hints for using a gas cooker quite rightly take prior place in the new cookery book recently published by Messrs. Stoves, Ltd., of Rainhill, Liverpool, and suggestions are made with a view to obtaining the utmost efficiency from the appliance. A useful table is given for cookers without the "Autokook" oven control, while instructions are also included for using this oven control correctly.

The book is attractively set out, and contains illustrations, in actual colours, of some of the firm's well-known gas cookers, including the "Bakerloo," the "Newhome," the "Reliable," made with three-burner hotplate, and suitable for small families, and the "Kitchenette," for flats, bungalows, and small residences, where kitchen space is limited.

The recipes have been carefully compiled by one of the leading cookery experts with a long and intimate knowledge of cooking by gas. Each recipe is the result of actual test, and in many cases has formed part of the menus at practical cookery demonstrations. Special attention has been paid to economy, keeping the costs within reasonable limits, so that the fullest use may be made of the dishes in the preparation of daily menus. The grouping into separate sections under soups, fish, meat, sweets, &c., will be found very helpful for quick reference. The suggestions for complete dinners cooked in the oven at one setting of the "Autokook" are given not only to leave more time for leisure or to perform other household duties, but to obtain the maximum value from the fuel used. An oven fully loaded is always more economical than when used for cooking single dishes.

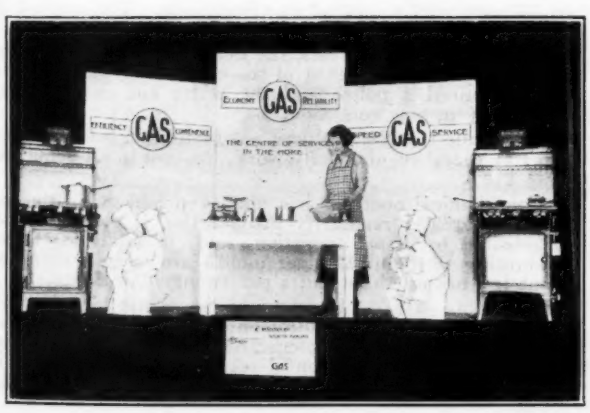
Although the majority of recipes give "Autokook" settings, the times and temperatures can easily be judged for a cooker not fitted with the oven heat regulator by referring to the table of comparative temperatures. Every care has obviously been taken to make this cookery book of the utmost service to users of Messrs. Stoves' cookers, and a comprehensive index at the end greatly facilitates reference to any particular recipe required.

First List of Bookings for Film "The Highway."

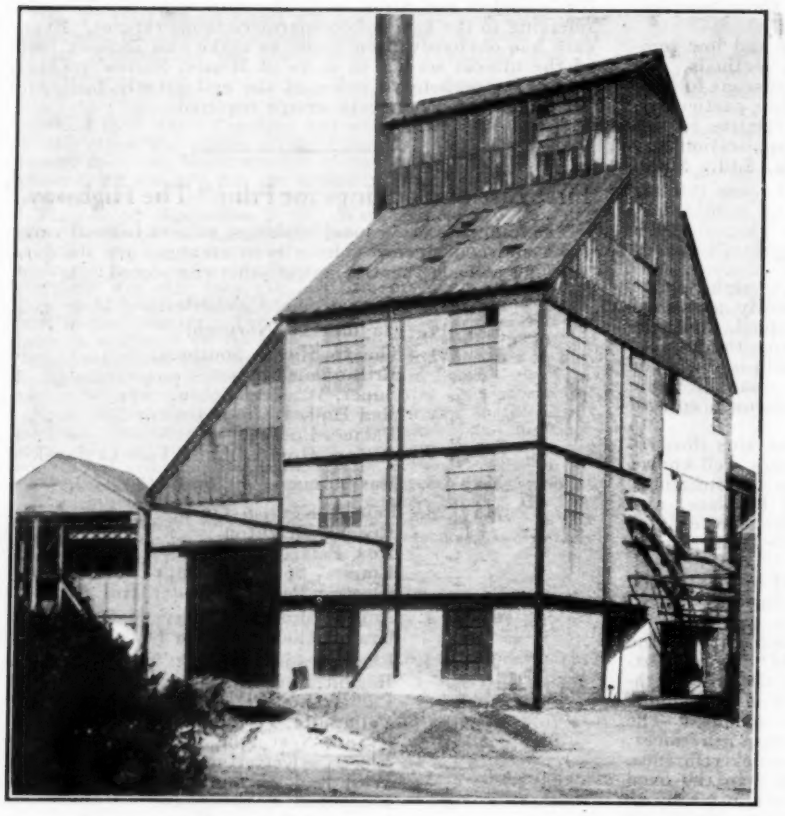
The following provisional bookings, subject to local variations and contingencies, have been arranged for six days' showing at each theatre, unless otherwise stated:

May 7.—Hippodrome, Colchester.
May 14.—Haymarket, Norwich.
May 21.—Theatre Royal, Southsea.
,, Britannia, Hoxton.
,, Super, W. Kensington.
,, Red Hall, Walham Green.
,, Palace, Putney.
,, Picture House, Maida Vale (4 days).
May 25.—Marlborough, Holloway (3 days).
May 28.—Palace, Kentish Town.
,, Regent, Brighton.
,, New Palace, Bristol.
,, Empire, Southampton.
,, Electric Pav., Lavender Hill (4 days).
June 1.—Angel, Islington (4 days).
,, Grand, Canning Town (4 days).
June 4.—Electric, Chatham.
,, Regent, Ipswich.
,, Palace, Luton.
,, Palladium, Plymouth.
,, Grand, Nottingham.
,, Electric, Kettering.
,, West End, Birmingham.
,, Hippodrome, Liverpool.
,, Gaumont Palace, Hammersmith.
,, Hippodrome, Middlesbrough (4 days).
June 8.—Empire Picturedrome, Bethnal Green (4 days).

Spirit of Progress at Broadstairs



Over 1000 people attended a series of Cookery Demonstrations which were held in the Broadstairs Pavilion last week. The occasion was a well-organized gas exhibition arranged by the Broadstairs Gas Company in co-operation with Radiation Ltd. Considerable local interest was aroused, resulting in many valuable inquiries and sales. A special feature of the demonstrations was the cooking of complete dinners in a "New World" cooker at one "Regulo" setting and time. All the food was inserted together and the oven chained and padlocked during the progress of cooking. At the end of a given time the oven was unlocked, and all the food, perfectly cooked, was withdrawn in the presence of the whole audience. A cake baking competition proved a great success, and the prizes offered by the Broadstairs Gas Company were eagerly competed for. The photograph on the left shows the Pavilion platform with Miss D. Hodgson, the Radiation lecturer, and two "New World" cookers. On the right is a group of water heating apparatus which formed part of the exhibit. This illustration shows Richmonds "Newlyn" and "Lynton" sink heaters, "Don" geysers, and also their popular "Equator" thermal storage water heater. The Gas Company also staged an impressive display of "New World" cookers in such a way as to add considerably to the success of this event.



MOORE GAS PLANT AT BURNHAM-ON-SEA

Mr. J. Hughes Cornish, in his Presidential Address to the Southern Association of Gas Engineers and Managers — see "JOURNAL" for April 5, 1933—made reference to a 50-million gas-works which is obtaining very high working results from a new type of gas plant. We understand that the works referred to is at Burnham-on-Sea, Somerset, and the matter has caused so much interest that we publish some particulars of the plant.

After 4½ years of satisfactory working with a generator of the Moore type, the Burnham Gas Company decided to install an additional unit of similar capacity, and entrusted the contract to Messrs. Andrew Barclay, Sons, & Co., Ltd., of Kilmarnock, who are now the sole licensees and manufacturers of the Moore plant.

The new plant, which was completed in June of last year, has been erected in line with the existing plant by extension of the side walls and adding a new gable. The house is steel-framed, neatly panelled in red brick with ample windows, and presents a neat and pleasing appearance on the outside. Inside there are roomy working platforms and convenient access stairs to all parts.

The plant itself consists of the Moore generator, the fan and engine, the extractor gear and drive, mechanical operator and drive, elevator and drive, overhead coal bunker with chutes, instrument board carrying the pyrometer, steam gauge, steam meter gauge, water tube gauges, clock and extractor indicator, steam valves, primary, secondary, and tertiary air valves, hydraulic valvebox, gas mains, &c.

The generator is enclosed in a steel shell, 28 ft. 6 in. high by 7 ft. 6 in. diameter, of ⅜ in. plates, with ample inspection doors, poke holes, and other conveniences. It is lined throughout with high-grade firebrick, and a space left between the brick and steel shell is filled with asbestos for insulation.

Steam for the plant and for the other requirements of the gas-works is provided by a coke-fired Cochrane boiler, with a Cornish boiler as a stand-by.

The plant was set to work in June, 1932, and after working for three months the Gas Company gave the manufacturers permission to make some tests on their own account.

The coal used for the purpose of these tests had been in the open yard for a long period, and as the weather prior to the tests had been wet, the coal was heavily charged with moisture. Later, dry coal which had been in stock under cover for nearly seven years was used, and it was with this coal that the second results, indicated below, were obtained.

From Sept. 5-10, 1932, the plant was in continuous work, day and night. Between the dates mentioned gas was produced at the rate of 35,980 c.ft. per ton of coal fed into the retort, the quality being 402 B.Th.U. per c.ft. and the therms per ton 144·63. The coke and tar produced during this series of tests averaged 4 cwt. and 5 gallons respectively, per ton of coal gasified.

At the conclusion of these tests three further days were taken for the production of higher quality gas. The average of the three days was 446·45 B.Th.U. per c.ft. at the outlet of the gasholder, and the gas, coke, and tar produced per ton of coal averaged 40,259 c.ft., 4 cwt., and 7 gallons respectively.

On Sept. 13, a 15½ hours' continuous test of best South Yorkshire coking gas coal produced gas of an average calorific value of 488 B.Th.U. quality.

The output per ton of coal carbonized amounted to 36,930 c.ft. and 6 cwt. of excellent coke. The amount of tar was not ascertained.

At the finish of the tests, the generator was emptied for examination. The interior of the coal retort was found to have acquired a polish and the water gas chamber was practically in new condition.

Meanwhile the No. 1 Moore gas plant had been repaired after 4½ years' regular daily work, the cost in all being less than £10.

A mechanical operator has now been added, by the use of which greater regularity in operation is obtained than is possible by hand operation, and, in addition, wages amounting to about £36 per month are saved, when the plant is working three shifts per twenty-four hours.

The Moore plant at Burnham-on-Sea is not large enough to meet all the gas requirements of the town, and the output is, therefore, supplemented by about 40% of gas from hand-charged horizontal retorts. For this reason it is not at present possible to obtain long-period separate results.

The following figures represent a full year's working when using best Yorkshire coal:—

Type of plant	Moore generator *plus* horizontals
Coal carbonized	2,548 tons
Gas made	54,774,800 c.ft.
Gas made per ton of coal	21,849 c.ft.
Average quality of the gas made	454 B.Th.U.
Therms made per ton of coal	99·2
Coke for sale per ton of coal	4·2 cwt.
Tar for sale per ton of coal	9·2 galls.

When using cheaper Yorkshire coal and 30% Forest of Dean coal the results from the new Moore plant and the

horizontals were slightly better financially. A higher quality gas was obtained with a little lower yield per ton.

Working Results during the Six Months ended March 31, 1933.

Coal carbonized	1,408¾ tons
Gas made	27,204,500 c.ft.
Gas made per ton of coal	19,311 c.ft.
Average quality of gas	468 B.Th.U.
Therms made per ton of coal	90·4
Coke for sale per ton of coal	5 cwt.
Tar for sale per ton of coal	10 galls.

During the last five years the net costs of purified gas into holder at Burnham-on-Sea, less residuals, shows a saving amounting to 11·16d. per 1000 c.ft. as compared with the preceding five years. The improvement is entirely due to the use of the Moore process of gas manufacture. Owing to the recent installation of a mechanical operator, there is this year an additional saving in costs of gas production amounting to 1d. per 1000 c.ft. of gas made.

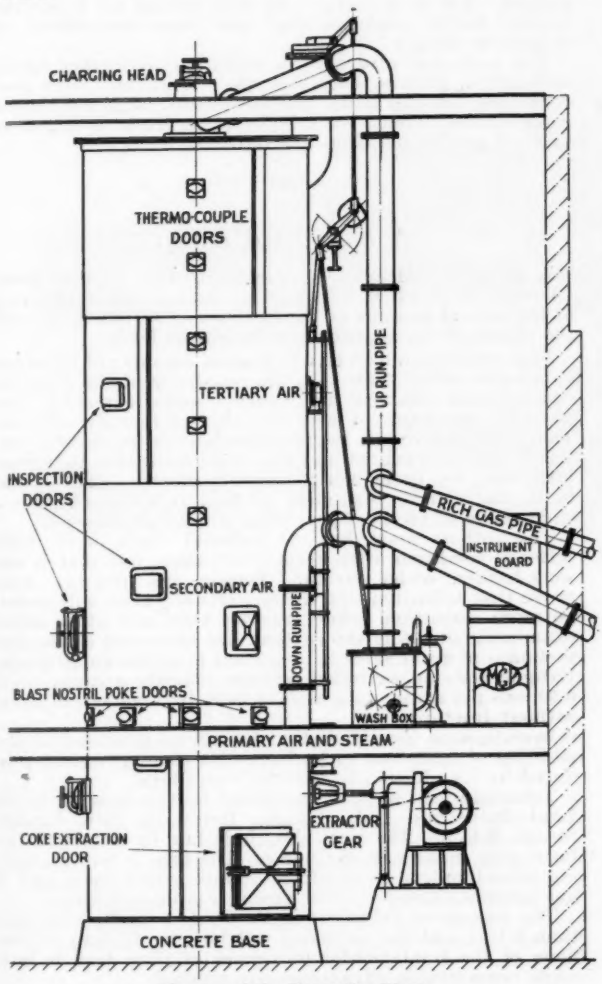


Diagram of the Moore Gas Plant.

"Fumifugium."

The cause of smoke abatement should be considerably enhanced by the reprinting of John Evelyn's pamphlet "Fumifugium," which was first published in 1661.

The National Smoke Abatement Society has done well to reprint John Evelyn's condemnation of the smoke evil if only to indicate how far along the road we have already travelled and how much further we have yet to go.

Gas and electricity undertakings and others interested in fuel or appliances which provide light and heat without smoke would find this excellent book of 42 pages, enhanced by delightful wood-cuts, a most valuable medium of propaganda. In order to obtain as wide a distribution as possible for this purpose, quantities of the pamphlet are offered to commercial undertakings and associations at special prices, particulars of which can be obtained from the Society, at 23, King Street, Manchester, 2. Single copies of the paper-covered edition are 6d., and cloth-bound copies are also available at 1s. 6d.

"The Progressive Gas Association."

A Novel Idea from Barbados.

"The Progressive Gas Association" is the title which has been given to a small club recently formed in Barbados at the instigation of Mr. J. W. Brown, Engineer and General Manager of the Barbados Gas Company, which is to be open to persons using or acquainted with gas.

The objects of the Association are for the mutual benefit of the Company and the members, who by introducing, spreading, and encouraging the use of gas cooking according to certain provisions, receive remuneration for so doing. The suggested outline is that members speak of the merits and advantages of gas cooking to their friends who live in the area of gas supply—and tell them of the help and general saving to be obtained by the use of gas. If with three months of notification to the Gas Company, through a member's influence, a person installs gas for cooking, on their payment for the installation, the member will be remunerated either in money or goods as desired, the remuneration to be based on 5% of the value of the installation.

The Association will only be operative for a limited period, and its membership will not exceed 50.

Traders' National Conference.

Important reforms in the commercial system will be called for at the Annual Conference of the National Association of Trade Protection Societies which is to be held in London on May 9 and 10, under the Chairmanship of the new President, Sir Francis Goodenough. The Association represents 40,000 manufacturers and traders in all parts of the United Kingdom.

The Conference is to draw the attention of the Government to the injustice to trade as frequently arising through minors obtaining credit without disclosing their age and later repudiating the debt, and to press for the introduction of legislation which will make the failure to state his age by a minor carry full legal responsibility for the debt.

The Conference will also press for the extension of the vote to limited companies at municipal elections.

Dissatisfaction is felt at the failure of the present system of commitment for debt in view of the attitude of many County Court Judges, and the Conference will urge the Government to introduce legislation making the wages of debtors attachable to debt.

An interesting feature of the Conference will be the initiation of a discussion by Mr. Charles E. Gorham, Managing Director of Bankers Commercial Security, on hire purchase in America under present conditions and its implications for British traders.

National Physical Laboratory.

The Report of the National Physical Laboratory for 1932, published by H.M. Stationery Office on Monday, May 1 (272 pp. quarto, 52 illustrations, price 14s.), describes the activities of the Laboratory during 1932.

Experiments carried out relative to humidity measurements (Report, p. 69) show that the measurement and control of moisture in the air are rapidly growing in importance in many industries. Spinning and weaving sheds are no longer restricted to localities where the climate is suitable, since plant is procurable to control the humidity in any building. Timber seasoning is now usually conducted in special kilns instead of in the open air, while in the conveyance and transport of frozen meat, the humidity must be carefully controlled if the food is to arrive in the best condition.

One of the most familiar instruments for measuring atmospheric humidity is the wet and dry bulb hygrometer, and the growth of interest in this subject is reflected in an investigation recently completed at the Laboratory, whereby tables have been provided enabling this instrument to be used between 40° C. and 100° C. (the boiling point of water). These tables have already been adopted in industry.

The same instrument is also being studied at lower temperatures. Below 0° C. the wet bulb becomes coated with ice, but it does not seem that this should invalidate its indications. A more serious difficulty is that the difference between the wet bulb and dry bulb temperatures becomes extremely small, so that the instrument is not very accurate at low temperatures. An effort to remedy this defect is being made by the development of electrical methods for measuring directly the difference between the temperatures of the wet and dry bulbs.

NOTES ON PLANT AND PROCESSES

A New and Simple Pipe Coupling.

The Johnson pipe coupling, manufactured by the Victaulic Company, Ltd., of King's Buildings, Dean Stanley Street, S.W. 1, is claimed to be probably one of the simplest forms of pipe joint. The chief feature of the coupling is that it is used on plain-ended pipes, thus entirely eliminating special preparation of pipe ends and reducing main-laying to the most elementary operation—only plain-end pipes and the Johnson coupling being required.

A certain amount of angular flexibility, while still retaining the utmost simplicity in mechanical construction, is permitted with the use of the Johnson coupling, the joint being sufficiently flexible to allow of curves with a radius of 80 or 100 yards being negotiated with straight pipes in 20 or 25 ft. lengths respectively. The average total deflection obtainable on each coupling is 5°, while coupled pipes deflected to as much as 7° have been tested up to 1000 lbs. per sq. in. without leakage.

The joint consists of a centre sleeve, two wedge-shaped packing rings, and two end flanges which hold the packing rings in contact with the sleeve and pipe ends. The sleeve normally has a central ridge which acts as a locating stop; but couplings can be supplied without this ridge if required. The length of the centre sleeve permits normal longitudinal movement of the pipes without leakage. The joint naturally provides for subsidence due to mine working or soft ground.

Standard Johnson couplings up to 30 in. diameter are suitable for hydraulic test pressure of 800 ft. head, while sizes over 30 in. can be supplied. Heavier couplings are provided for much higher pressures, and couplings have been tested up to 2000 lbs. per sq. in. without leakage. Fittings of all kinds are supplied for use with the joint, including valve adaptors for inserting valves into pipe lines.

The packing rings are supplied of different materials, including good quality rubber, either plain or reinforced with canvas, or with lead or semi-ebonite tips, &c., the particular type depending on the conditions under which the joint is required to work. For gas and oil mains a special quality composition is supplied. The use of the Johnson coupling reduces freight and laying time and costs, the work being easily carried out by unskilled labour.

An Attractive Cooker Catalogue.

The modern vogue of coloured finishes for cookers is particularly emphasized in the new catalogue recently issued by Cannon Iron Foundries, Ltd. of Deepfields, near Bilston, Staffs.—and not only is the stoved enamel finish which is now so popular with the housewife depicted, but the firm go a step further in the production of an all-colour finish in green, primrose, and cream enamels.

From cover to cover this catalogue radiates colour, and the beautiful front cover design, which was produced by nine colour workings, is only the forerunner of other attractive illustrations within, showing just how the various finishes would look in the kitchen. Mention must not be omitted in this connection of the very fine section in the centre of the publication devoted to page illustrations in the most delightful colours of modern kitchen settings incorporating various types of Cannon gas cooking apparatus. Here we see examples of Cannon cookers for all requirements—the "New Challenge," which is supplied in six sizes adequately to provide for the needs of any family; the "Centenary" range for large kitchens, where the housewife prefers to have the oven and hotplate on the same level; the "Cambridge," which is provided with a specially constructed bottom flue oven which prevents short circuiting, eliminates condensation, and gives a very even heat, an additional feature being the new design of hotplate, the burners of which are drilled with radial holes in four sections, giving even heating; the "Oxford," which is an ideal intermediate cooker, whose appearance in mottled enamel finish is very attractive; the "Cottage," which is specially designed for cottages, flats, or maisonettes, being compact yet efficient, and capable of cooking adequately for a small family; and, finally, the "Bachelor" griller, which, as its name implies, can be relied upon to cook a meal and boil a kettle at the same time for the self-dependent "bachelor" of either sex.

All these above mentioned cookers, together with other of the firm's well-known models, are dealt with in detail in the course of the catalogue, with details of their individual features, advantages, and finish.

The all-colour finishes recently taken up by the firm form a charming blend, permitting of a variety of colour schemes for the kitchen, and combining artistic merit with labour-saving facility. The cornice, bridges, crown plate, front and base, legs of stand, and pillars of plate rack are in green enamel; the door frame and top of stand in primrose; and the door panel, sides, loose wrought crown plate, splash plates, and griller pan in cream enamel. The oven linings and oven fittings are in mottled enamel finish, while all taps and oven connections are chromium plated.

The catalogue also devotes attention to further cooker accessories, grillers, hotplates, the "Autimo" oven heat controller, carving tables and hot closets, large gas ranges, confectioners' ovens, wash boilers, gas irons, and various types of gas boiling rings and burners.

A New Lead Alloy.

A paper by Messrs. W. Singleton and Brinley Jones (Associated Lead Manufacturers' Research Laboratories) at the annual meeting of the Institute of Metals dealt with the effects of the addition of tellurium to lead.

Experiments on load to which small amounts of tellurium have been added show that the resistance of the metal to concentrated sulphuric acid is remarkably increased. The physical properties of lead are also profoundly affected. The temperature of re-crystallization is increased, and tensile tests carried out on rolled sheet show that tellurium-lead can be permanently work-hardened. The work-hardening can be regulated, so that rolled sheet with a wide range of physical properties can be produced.

The authors show that the material exists in the fully softened condition after normal extrusion, but that it can work-harden under strain. Tensile and freezing tests prove that tellurium-lead in the extended state will undergo more distortion before fracture than any other metal examined, and it is shown that the character of the distortion is of great value in important practical applications. Fatigue tests on extruded sections indicate a range of $\pm 0{\cdot}50$ tons per sq. in. on a basis of 10×10^6 reversals of stress without fracture

Investigation has shown that the effects produced by the addition of tellurium to lead are also to some extent produced by its addition to various lead alloys.

Tellurium lead is being marketed by Goodlass Wall and Lead Industries. Ltd., London House, 3, New London Street, E.C. 3. The new alloy bids fair to terminate the burst pipe menace in the home. The firm is now marketing tellurium-lead in the form of sheets and pipes, and it has already evoked interest among gas undertakings.

The amount of tellurium in the lead is small, being less than 0·1%, and the principal outstanding feature is that none of the fundamental properties of pure lead is lost, while considerable advantages are secured.

The resistance to corrosion as measured by loss of weight is increased from about eight to twelve times. The importance of this in the construction of lead-lined sulphuric acid plants, storage tanks, and in chemical plant generally is obvious.

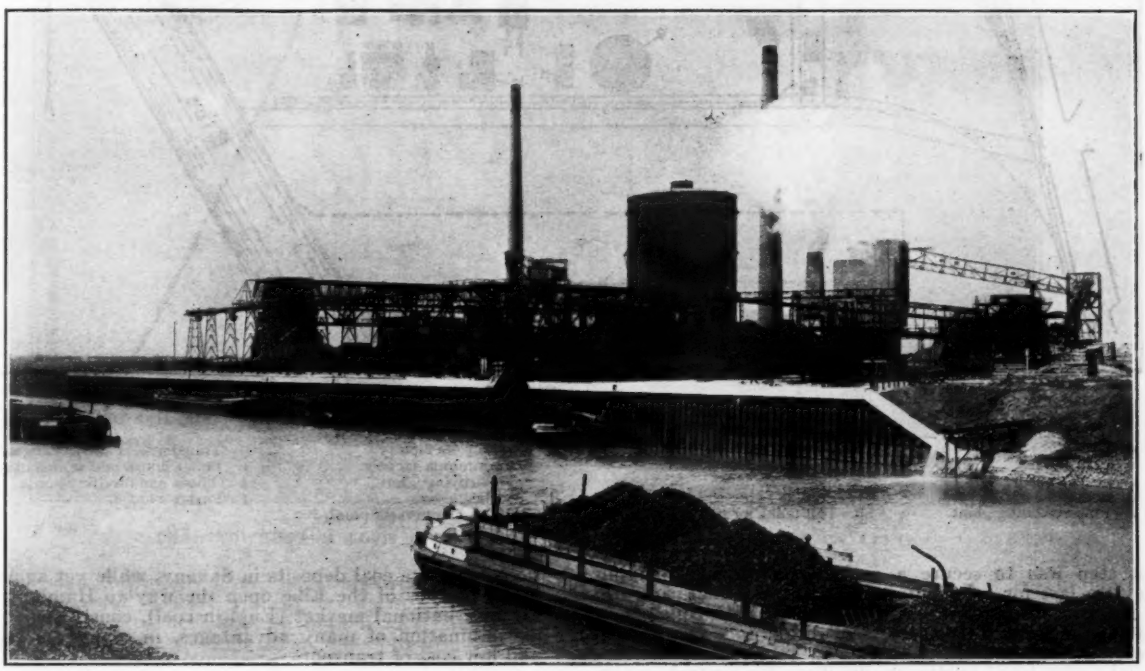
The most obvious change which takes place by the addition of tellurium is the closer grain structure secured, which is apparent to the naked eye, thereby giving a very smooth surface and complete absence of roughness or coarse crystalline structure.

Tellurium-lead pipes are soft, as produced, and strengthen when subjected to strain, so that the factors which usually are responsible for the failure of pure lead pipes, such as frost, vibration, bending, &c., actually improve the tensile strength of tellurium-lead pipes. Tests have shown that tellurium-lead pipe subjected to one more freezing than is normally sufficient to burst ordinary lead pipe actually withstood a greater hydraulic pressure than unfrozen ordinary pipe. It has also been proved that, in subjecting tellurium-lead pipes to the tensile strength required to fracture ordinary pipe, the resistance of the former is increased by approximately 70%.

One of the great advantages of this new alloy is the resistance to vibration.

LONG-DISTANCE GAS . . DISTRIBUTION . .

An Up-to-Date Plant in Germany —the Magdeburg Gas-Works



GENERAL VIEW OF GAS-WORKS FROM THE ELBE WATER FRONT.

The second half-year of 1926 may be said to have inaugurated a new era so far as the long-distance distribution of gas in Germany is concerned. At that period, the coal mining firms—more especially in the Ruhr district, which is the principal industrial area in Germany—began seriously to encourage the practice of high-pressure distribution, their starting-point being the gases most readily obtainable in the industry, such as coke oven gas, lignite gas, &c.

Those who have followed subsequent developments in Germany will know that within a comparatively short time a large network of long-distance gas mains has been constructed. A number of reasons, very interesting in their economic and technical aspects, have contributed to bring this into being. In the lay-out and construction of the several systems, also, quite a number of new technical ideas have been developed and put into practice which cannot fail to exert a considerable influence upon the methods of gas distribution adopted in every other country. Some time ago a plan was formed by the colliery and coke oven undertakings in the Rhineland and in Westphalia to utilize for industrial heating purposes the very large quantities of coke oven gas generated in the district and to transmit it by high-pressure pipelines to considerable distances from the generating source. In order to increase the amount of gas available for such a scheme it was decided to limit the gas used for heating purposes at the mines and coke oven plants themselves, and to substitute for this gas not easily disposable coals and coke for boiler firing and for furnace heating, gas generated from coke breeze, or blast furnace gas where such was available. Some interesting details will be found in the " Gas Age-Record " of June, 1931, also in the " Engineer " (London) of June 30, 1930.

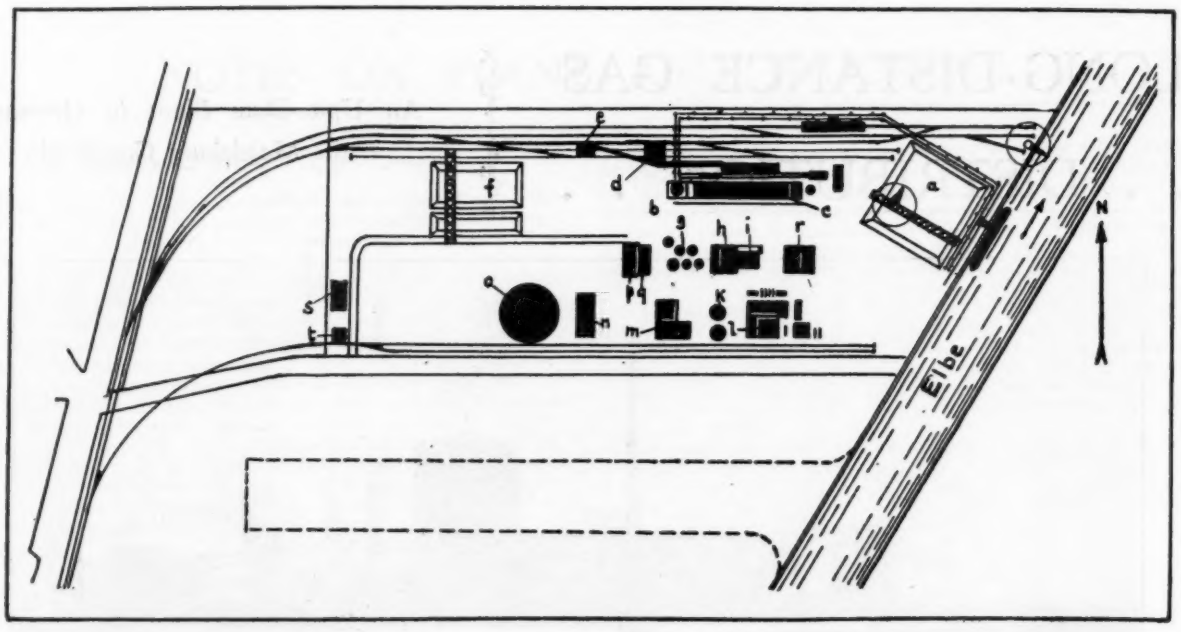
Carrying a Main Across the Rhine.

From the purely technical standpoint and with particular reference to the method of laying the mains, the supply system from the Ruhr district to the City of Cologne is deserving of special mention. It was necessary for the mains to be carried across the Rhine, in order to reach the coke-oven compressor plant it was proposed to erect in the manufacturing part of the city. After studying the several alternative plans that appeared possible, such as carrying the mains overhead or under water, securing them to existing bridges, the construction of a specially reinforced tubular suspension bridge or of a cantilever bridge employing the tubes themselves as the principal supports, the final choice fell upon the syphon system. The work was accomplished by laying a syphon consisting of two mild-steel main carriers each of 15·7 in. clear bore. The chief difficulty was that the whole task of joining up the component parts of the syphon and of placing it in position had to be completed within a couple of days, the river traffic at Cologne being so dense that its obstruction for any longer time could not have been tolerated. These difficult conditions were rendered still more exacting by the insistence of the Rhine Navigation Authority upon a clear lane 120 yards in width, being left for the passage of shipping between every point where work was in progress during the operation of laying. This requirement however was satisfactorily met by employing the new syphon-laying process developed by Eng. Drüke. The essence of this is that the length of pipe to be submerged is suspended by a cable carried over loose pulleys and then lowered. This occupies very little time. The tension of the vertical cables by which pipe is secured to the loose cables, then compensates itself automatically. The whole length of pipe can be let down at one operation without undue lateral strain on it at any point, provided always that the points of suspension be properly distributed in accordance with calculations made previously.

Besides the above, quite a number of other distribution systems have been constructed, the technical details of which embody some interesting innovations. To describe them all, however, would take up too much space. Our present purpose is to deal with the large gas-making plant quite recently devised with the object of ensuring gas supplies in central Germany.

Centrally-Situated Gas-Works.

The aim pursued in designing this plant was to provide a centrally situated gas-works capable of supplying the needs of a large consuming area, without the risk of breakdowns due to the failure of coal supplies or similar causes. The



GROUND PLAN OF THE LARGE GAS-WORKS AT MAGDEBURG.

a Coal store.
b Coal tower.
c Oven battery.
d Coarse screening plant.
e Fine screening plant.
f Coke store.
g Coolers and washers.
h Gas exhausters.
i Pumps.
k Tall tanks for tar and ammonia.
l Benzole factory.
m Ammonia factory.
n Purifying plant.
o Gasholder.
p Gas compressor plant.
q Transformers and switchgear.
r Boiler house and workshops.
s Offices and dwelling house.
t Porter's lodge.

first step was to secure a coal deposit offering supplies likely to last for a long time. In the manufacturing area of central Germany, destined to be the main consumer of the gas distributed from the new works, and, furthermore, likely, as will presently be shown, to have its activities greatly stimulated by the availability of a central gas supply, there are, it is true, a number of lignite deposits, but no pit coal. The extraction of gas from lignite by the methods of low-temperature carbonization elaborated up to the present has not yet been brought to such a pitch of practical perfection, especially in the matter of cost, as to justify placing reliance upon it for the purposes of a large-scale distribution scheme, though it is true that some distant transmission systems employing lignite exist in Germany already. It was decided, therefore, to draw coal supplies from outside the actual area of operations and to use Westphalian coal, which is known to be rich in gas and very suitable.

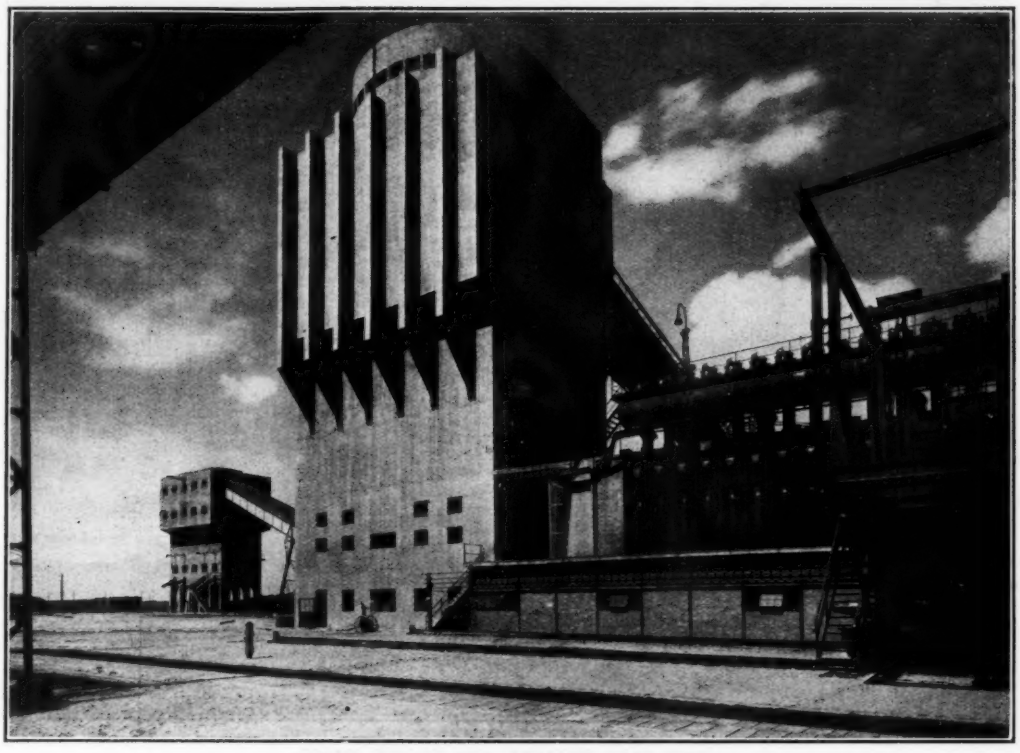
When the mining interests in Germany, as already mentioned, propounded their plan for supplying gas to the whole of Germany from a single generating plant situated in the Ruhr district, as being the area most naturally indicated for the purpose, with its existing coke ovens, a fierce controversy was let loose. This was based upon considerations not only of private interest, but also upon much more deep-seated questions of national economy and expediency. One of the objections raised was that it was intolerable for an entire nation to become dependent in this way on a single generating plant, having regard to the risk of strikes in the industrial area of Germany, but above all in being near the frontier and therefore exposed to the risk of invasion by the French. These discussions between the leading gas authorities in Germany finally led to recognition of the fact that it was more important to make sure of gas supplies throughout the whole country in every eventuality than to attach undue weight to the trifling diminution of cost which might result from the adoption of the Ruhrgas A.-G. plan first mentioned. They also had the effect of leading to the selection of the site for the new central gas-works, which was accordingly erected at Magdeburg, in the heart of the manufacturing area of central Germany. This is the point of junction between the Mittelland Canal, one of the most important artificial waterways in Germany, and the River Elbe. The effect of this is that coal supplies can be brought to the works not only overland, but also by cheap water transport. This is of material importance to any industry which, like the Gas Industry, is mainly dependent upon cheap bulk transport of raw materials as well as output. The possibility of obtaining coal from Westphalia by water, via Berlin and the Silesian waterways, or again via the Elbe and its connections from the coal deposits in Saxony, while yet again the lower reaches of the Elbe open the way to Hamburg and the international market (English coal), constitute at once a combination of many advantages, in regard to facility and low cost of transport.

Reaction on Other Businesses.

The idea of centralizing gas supplies and creating a large gas-making plant has within a short time reacted upon manufacturing and other business activities in a manner which had not been foreseen when the original plans were laid. The gas interests, indeed, in a sense deserve credit for having selected a suitable spot in central Germany around which a new phase of industrial development could be centred, and for providing an impulse which has led to the creation of new manufacturing concerns. To mention only one of these, the mining business of Georg von Giesche's Heirs is setting up a zinc works, employing the latest electrolytic process, near the big gas-works on the new wharf at Rothensee, near Magdeburg. Not only is the erection of this zinc works a promising augury for the gas-works, foreshadowing increased consumption of gas as well as the mutual interchange of bye-products and chemical goods, but it has led in its turn to the building, in the immediate proximity of the gas-works, of a large power plant, which will supply the considerable amount of energy required by the zinc works.

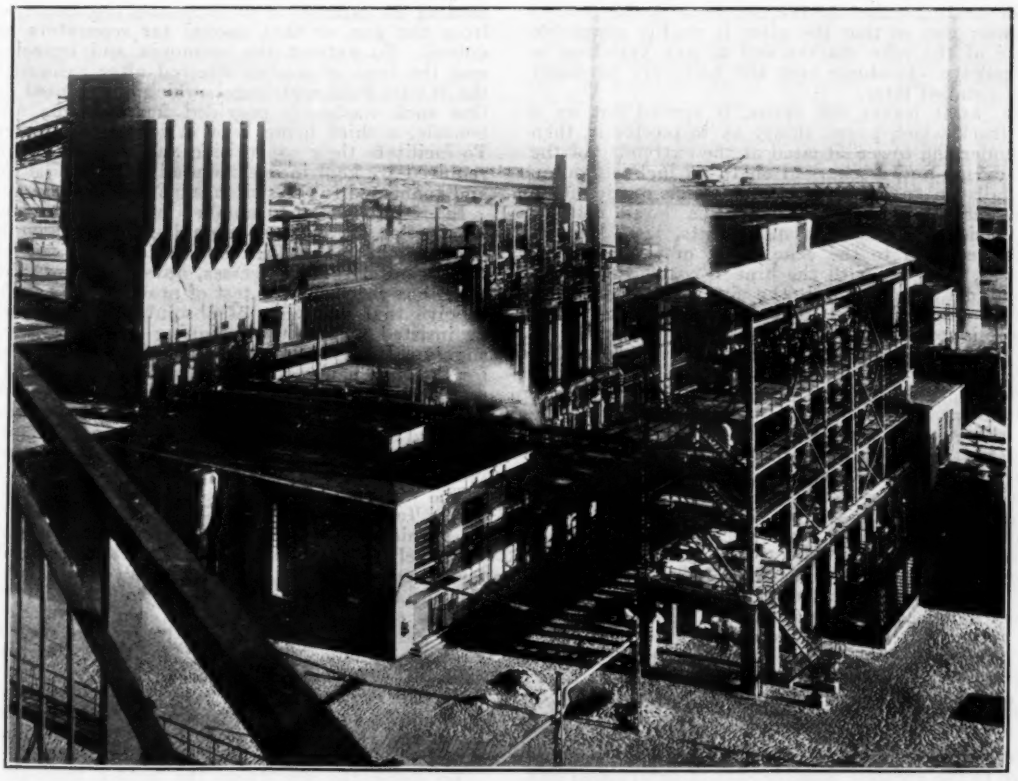
In view of the conditions existing it was thought desirable that the gas-works should take the form of a coke oven plant. One factor which contributed to this decision was the cheap transport facilities already described. The first matter that had to be borne in mind in planning the general lay-out was the large volume of goods traffic to be expected on the works premises. A daily throughput of 1200 to 1300 tons of coal, with corresponding quantities of coke had to be allowed for, and water as well as rail transport had to be taken into account. While the ultimate plan is to obtain coal supplies mainly by water, rail-borne coal is essential in the first instance, as the Mittelland Canal will not be open for traffic until about a year hence, and in any event breakdowns in the water transport system require to be provided against.

It was necessary, therefore, to have not only an extensive network of railway tracks and sidings, but also internal transport facilities equal to all requirements, and these considerations were decisive in the final selection of the site, which had to be suitable in regard to location, shape, and other natural advantages. Reference to the illustration will show that the choice may be regarded as a happy one. In the east, the site extends to the new harbour basin, while in the west it abuts on the arterial road

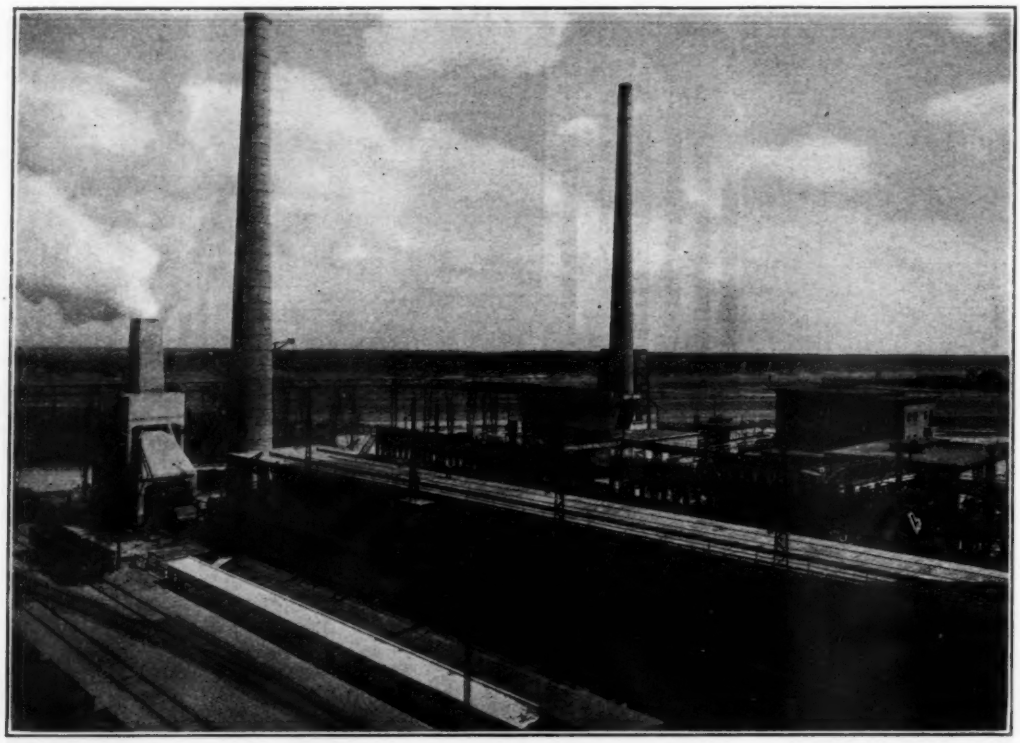


COAL TOWER AND COKE OVEN BATTERY—COKE SCREENING PLANT ON LEFT.

passing through the whole of the new industrial area, as well as the adjacent dockside railway tracks, so that railway and river approaches, likewise inward and outward traffic, are set opposite to each other, thus obviating the inconvenience of cross-traffic on the actual works premises. The extended shape of the site also made it possible to provide long rail sidings. The coal handling is so arranged that the incoming railway trucks are discharged into a long bunker capable of holding one day's supply. Large capacity trucks of the bottom discharging type are emptied direct into the bunker, while for trucks of the ordinary type a tippler is available. From the bunker, the coal is lifted by a grab crane into the wagons of a suspended railway driven by an endless cable, which conveys it either to the tower or to the store, above the whole area of which a travelling bridge is provided for this purpose. From the coal store the coal can then be transferred, by means of the grab travelling on the distributing bridge, into the wagons of the suspended railway, whence it is conveyed to the coal tower in the same way as the coal arriving direct. The



VIEW OF GAS-WORKS.



COKE OVEN BATTERY AND ENGINE HOUSE.

same plant serves for handling the water-borne coal, which is unloaded from the barges or lighters by cranes travelling along the dockside.

Coke Oven Plant.

The oven plant is placed parallel to the railway siding. For the present one battery comprising two units of 30 chambers each has been constructed; space has been left and other provision made for the installation of a second battery whenever needed. Between the two batteries is the coal tower, with a capacity of 3000 tons. The ovens used are of the under-burner compound type. They are designed for heating either by the gas made in the process or by producer gas, so that the plant is readily adaptable to the state of the coke market and to any variation in gas requirements. Producers for the necessary producer gas will be installed later.

The coke, as it leaves the ovens, is spread out on a quenching truck which passes slowly by to receive it, then quenched under the tower situated at the extremity of the battery of ovens; and discharged on to an inclined ramp, whence it falls on to a conveyor belt which carries it to the coarse screening plant. There, the large coke is separated, and, according to requirements, loaded direct into trucks, removed to the coke store, or broken. The smaller pieces, together with the broken coke, are carried by a second conveyor belt to the fine screening plant, where the grading is done. Here again, the necessary handling appliances are provided so that the coke can be loaded direct into railway trucks or road vehicles. The conveyance of coke to the store is effected by means of bucket trucks into which the material is fed by gravity from the bunkers in the two screening houses. Above the coke store there is also a distributing bridge, the jenny of which lifts the non-tipping buckets from the trucks and empties them so that the various grades are kept separate. To reclaim coke from the store there is a grab operated by the same jenny. The same bucket trucks are used, when coke is to be despatched by water, to convey it along a special railway to the quayside, the buckets being lifted and emptied by revolving cranes into the barges waiting alongside. The use of the bucket trucks is economical and expeditious whatever the mode of transport employed, as it minimizes actual handling and saves waste.

For the despatch of other bye-products from the coke ovens, there is a special railway laid along the southern boundary of the works site.

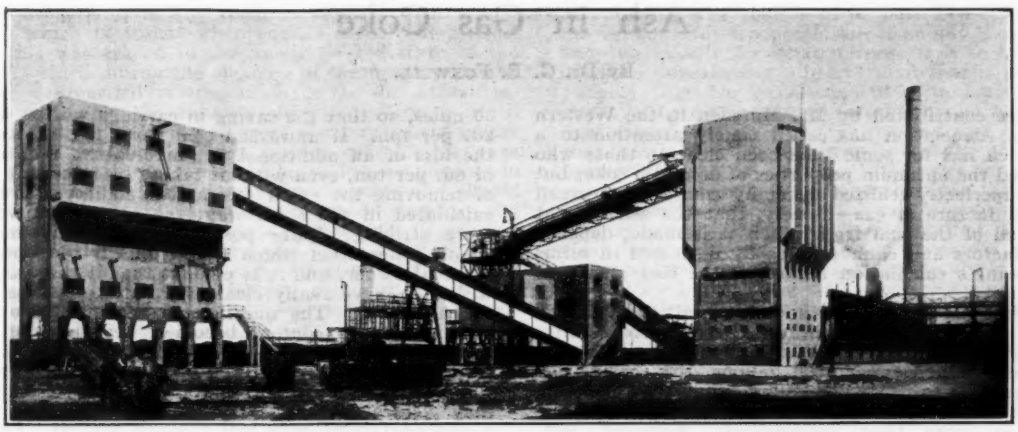
Ease of Supervision.

The several units of the plant are grouped everywhere with an eye to the greatest possible ease of supervision and operation, coupled with the shortest transport distances and the minimum of piping. The whole of the gas issuing from the ovens is passed successively through the first coolers, the gas exhausters, the second coolers, and the washers. It is here that any gas needed for the heating of the ovens is separated and fed back direct to them. The surplus gas is passed through the dry sulphur purifiers and thence reaches the gasholder. Before the coolers, a so-called tar pocket is interposed to receive the condensation products that collect in the collecting main. To ensure the adequate and efficient cooling of the gas, coolers of ample dimensions, on the Reuter system, are provided. The gas exhausters are of the centrifugal blower type, capable according to experience of removing the last traces of tar from the gas, so that special tar separators are not required. To extract the ammonia and benzole from the gas, the type of washer selected after exhaustive tests is the Walter Feld centrifugal, which is also used in America. One such washer is provided for ammonia and one for benzole, a third being kept in reserve for either purpose. To facilitate their supervision and working, all the pumps required are kept in one room adjoining the gas exhausters and connected to the switchgear in the gas exhauster room.

In recent times a number of new processes for the elimination of hydrogen sulphide from gas have been introduced, and some of them look quite promising. A close examination of these processes, however, shows that none of them has yet stood the test of practice for a sufficient time to give that warranty of absolute reliability which must be insisted upon when designing a system of central gas supply. It was therefore considered necessary, at any rate for the time being, to fall back upon the old and well-tried dry process. Experimental work is, however, being continued on the alternative and less costly processes, and it is hoped that before very long they may be adopted. They should render considerable economies possible owing to the increased use of automatic methods.

The waterless gasholder has a useful capacity of 100,000 cub.m. (approximately 3½ million c.ft.). In view of the large area which it covers, the gasholder has been given a comparatively deep-set foundation, and the bottom of it is used for the storage of tar, of which it can hold about 3500 tons. For the transport of tar and the collection of ammoniacal liquor, special overhead tanks are provided. The ammoniacal liquor is used partly in the manufacture of aqueous ammonia, but mainly for the extraction of nitric acid, of which the zinc works absorb a large quantity, while the crude benzole is converted into refined products in an up-to-date and well-equipped benzole factory. At a later date, it is proposed to erect a tar-distillation plant attached to the gas-works.

To drive the gas from the holder through the long-distance mains, steam-driven piston compressors are used,



COKE SCREENING PLANT, COAL TOWER, AND BATTERY.

(Between the Screening Plant and Coal Tower, the Central German Power Works (Mikramag, A.G.) can be seen in course of construction.)

while for the delivery of supplies to the zinc works, and other near-by points, electrically driven turbine blowers are available. A separate annexe to the compressor room accommodates the extensive transformer and switchgear for the electrical energy used about the works. The steam needed for the buildings and plant first erected and installed is generated in a boiler-house on the works premises; as and when, however, increased quantities of steam are found necessary, it is intended to obtain them from the power station which is near the gas-works. To ensure the utmost economy and reliability, manual labour has been kept down to a minimum, and the most extensive use made of mechanical appliances and electrical power.

The output capacity of the plant now approaching completion is calculated on the basis of a yearly consumption of 400,000 tons of coal, and the ovens being heated with gas made in the process, at approximately 65 million cub.m. annually or 100 million cub.m. if producer gas is used for heating. When the additional battery of coke ovens is built, it will be possible at once to double these figures.

IN CONTINENTAL COUNTRIES - - -

Abstract Translations from the Technical Press of France and Germany.

STUDIES ON THE AGGLUTINATION TEST FOR COALS.

A lengthy article by L. Crussard and M. Gauzelin in "Revue de l'Industrie Minérale," Oct. 1 and 15, 1932, is reproduced in the "Journal des Usines à Gaz," 1933, 57, 33-41 (Jan. 20), 65-70 (Feb. 5), 82-89 (Feb. 20), and 136-144 (March 20).

The limitations of the usual agglutination tests and the anomalies sometimes encountered are first discussed. The authors then develop their own method which may best be explained by means of the following symbols:

S = Weight of sand per unit weight of coal.

R = Crushing load of the carbonized product in kilos.

h = Parts of coal per 100 parts of sand = $\frac{100}{S}$.

[It is found that a linear relationship exists between R and h.]

ρ = increase of R per unit increase in h.

$a = \frac{100}{h - \frac{R}{\rho}}$ *i.e.*, a represents the weight of sand per unit weight of coal when R = O.

$\pi = \rho h - R$. This equation represents the linear relationship between h and R.

ρ_0, a_0, π_0 are corresponding values for a standard coking coal.

$r = \frac{100\rho}{\rho_0}$ *i.e.*, a characteristic of the resistance of a particular coal.

$a = \frac{100a}{a_0}$ *i.e.*, " " " agglutination " " "

$p = \frac{100\pi}{\pi_0}$ *i.e.*, " " " pressure " " "

It follows that $a\pi = 100\rho$, $a_0\pi_0 = 100\rho_0$ and $ap = 100r$.

For a typical coking coal, ρ_0 is approximately $\frac{3}{4}$, a_0 approximately 50, and π_0 approximately $\frac{1}{4}$; hence by arranging that r, a, and p each become 100 for a standard coal, the values of r, a, and p for any coal may be obtained by multiplying its ρ, a, and π values respectively by 60, 2, and 30.

When, for a series of coals, r and a are plotted, a series of points is obtained, and coals of allied coking properties fall into well-defined groups. As a criterion of coking quality, the value $q = r - 0{\cdot}4p$ is taken. Then, for the standard coal, $q = 60$. Subsidiary equations as follows may be employed to express the same behaviour—namely,

$q_1 = \frac{40}{a} + \frac{60}{r}$ which becomes 1 for the standard coal, and

$q_2 = a - \frac{60}{p}$ " " 40 " " " .

In the case of blends, the value of a may be calculated by simple proportion from the values of the individual coals and the composition of the blend. The calculated values are in good agreement with the determined values. However, r and p values of blends calculated in this way are always higher than the determined values. However, the reciprocal of the p value of a blend may be calculated by simple proportion from the reciprocals of the p values of the constituents. The r value of the blend may then be calculated from the relationship $100r = ap$.

The characteristics of different types of coal may be illustrated as follows:

Coals with average properties.—a ranges between 70 and 113 and r ranges between 84 and 128. There is a tendency for high values of r to be associated with low values of a—*i.e.*, p increases progressively as r increases and, in fact, ranges between 76 and 170. If the characteristics of a coal come within these limits, the coal is a coking one. It does not, however, follow that all coking coals have properties within these limits, nor, indeed, is this the case.

Coals with high resistivity.—a ranges between 60 and 90 and r may be as high as 170. p is also high and may exceed 200. Such coals represent a prolongation of the group containing the previous class and are also coking coals. This class includes coals which may cause trouble due to permanent expansion and require blending with non-coking coals of high volatile content.

Coals with high agglutinating power.—a exceeds 150 and may even reach 200. r is low—*e.g.*, 40-50. Hence p falls to 40, 30, or even 20. A very high value of a coupled with a low resistivity is conducive to fissuring in the coke.

Coals with feeble characteristics.—These coals include the non-coking coals of high volatile content.

The above limits are, of course, only approximate.

The final portion of the paper is devoted to a discussion of the weathering of coal in the light of the authors' theories.

Ash in Gas Coke

By Dr. G. E. Foxwell.

The paper contributed by Mr. Marsden to the Western Junior Gas Association has called timely attention to a matter which has for some time been clear to those who have studied the optimum properties of domestic coke, but which is imperfectly realized by many who are concerned in the manufacture of gas—namely, that the ash content of coke, and of the coal from which it is made, depends on many factors and cannot be easily dismissed in terms of Dr. Lessing's calculation regarding the cost of ash to the community.

In the first place, there is the colliery attitude. Clean coal, like any pure material, is a costly commodity. Chemists will recognize that while the cost of water may be expressed in pence per 1000 gallons, the cost of distilled water runs to pence per gallon, while that of "conductivity water" is pence per ounce. Progressive purification entails more than progressively increased cost. Exactly the same applies, though in a less degree, to coal. When we ask for clean coal it is well to know in advance exactly what that demand will involve. There is a wide divergence between the different varieties of coal, and the effect will not be the same at every colliery; it will depend on the washability curve of the coal. Here, for example, are two typical coals, one simple to wash, the other containing what is known as "intermediate product" that cannot be cleaned easily:

Specific Gravity	Coal A.		Coal B.	
	Weight of Fraction.	Ash Content.	Weight of Fraction.	Ash Content.
	%	%	%	%
Below 1·35	74·9	3·38	62·5	3·71
1·35 to 1·5	5·2	18·7	8·4	14·43
1·5 to 1·6	0·9	29·7	3·8	34·4
1·6 to 1·7	0·2	37·7	3·1	41·2
1·7 to 1·9	1·6	52·0	3·3	52·0
Above 1·9	13·2	78·6	14·9	77·0
Dust below 1 mm. in size	4·0	17·5	4·0	36·0

If "clean coal" is required, obviously anything that is dirty must be thrown away. The first thing that comes under this category is the dust. Both coals will, therefore, lose 4% of their initial weight by preliminary dedusting before washing, and in this way the ash content of the remainder will be reduced in coal A from 15·76% to 15·7% and in coal B from 20·72% to 20·1%. The reduction in initial ash content is inappreciable, but if clean coal is desired it is clearly impossible to put back such high-ash material into the washed coal. Whether it is advisable or otherwise to exclude the dust from the coking slack depends on its composition, and as those who have followed recent work will know, there is evidence that from the point of view of coke quality the fine dust may be one of the most important constituents of the coking coal.

It may without undue error be considered that normal coal washing consists in the removal of most of the material heavier than sp. gr. 1·6. The result of normal washing of these coals will be to reduce the ash content of coal A to 4·66% with a total loss of some 19% of the original material, and of coal B to 6·47% with a total loss of over 25% of the original material. These, however, are theoretical figures, and in practice the coal loses at least 2% of its weight in the dirt, while the washed coal contains 2% of dirt. The practical ash contents in normal washing will thus be 6·06% and 7·70% respectively, figures which at the collieries in question are actually considered to represent good working. To bring the ash contents down to below 4%—which would still mean 6% in the finished coke—at least another 5% of the coal A would have to be discarded (or a new washery built, operating on more efficient lines than most known washers), while for coal B at least 40% would have to be discarded, it being realized that the material below 1·35 sp. gr. *as prepared in the laboratory* still contains 3·71% of ash.

The net result is that something like 25% of coal A and 40% of coal B must be discarded. In a very clearly divided coal like A, where the material discarded, even with its 2% of coal, will still contain over 70% of ash, the purchase of really clean coal is a possibility, especially bearing in mind the freight on the ash. If, for example, the coal has to travel 100 miles to the gas-works at 1d. per ton mile, the carriage on 1 ton of 7 to 8% ash coal (say, 0·925 ton pure coal substance) will be 8s. 4d., but the carriage on 0·964 ton of 4% ash coal (again 0·925 ton pure coal substance) will be almost exactly 8s. 0½d.—a saving of 3½d. The average distance, however, over which the coal must be conveyed is probably less than 50 miles, so that the saving in carriage will be well under 2d. per ton. If unwashed coal costs 10s. at the pithead the loss of an additional 5% involves an additional cost of 6d. per ton, even without taking into account any costs of removing the extra dirt at the colliery. If coal B be calculated in the same way, the figures are very much more striking. Quite possibly there are items in this simple calculation which would appear too optimistic to the coal owner, and it is evident that if the Gas Industry wishes to have really clean coal, they must be prepared to pay for it. The question of ash in coke and of the permissible ash content becomes, therefore, of considerable importance.

In Mr. Marsden's analysis of the position he points out that a coal with a high ash content, even as high as 12%, may yield a coke better suited to the domestic user than a coal containing only half this ash content. Everything, in his view, depends on the character of the ash, on whether it is evenly distributed or in the form of "bats." The ash content of the coal must be considered in relation to the use to which the coke is to be put. Coke used industrially is not included in the present discussion.

Domestic coke is principally used for two purposes—coke boilers, or closed stoves, and open fires. In the coke boiler, the ideal procedure from the point of view of the householder is to light the fire in September and let it out again in May. In that way there is the minimum of trouble, the house is provided with a useful form of central heating—if the stove, water pipes, and flues have been properly situated in the house—and constant hot water at the minimum price. The writer has kept a coke stove of this character in for five or six days continuously, but no longer. At the end of that time the accumulation of ash in pieces too large to be raked through the firebars has made it imperative to let the fire die out for cleaning. The difficulty is two-fold, and consists partly in the presence of the "bats" described by Mr. Marsden, and partly in the formation of clinker. Experience shows that these are equally deleterious, and that an easily fusible ash is the worst feature in any coke for closed stoves. With the present design of stove even a refractory ash may cause trouble, since the temperature in the coke when working with a low firebed and full draught may become very high, but any ash fusing at less than about 1300° to 1400° C. will prove troublesome, while a really low-fusing ash may make the stove unmanageable. If the ash content be high, the consumer is paying for ash instead of for fuel, and this will put an upper limit on the ash content of the coke. Just what this upper limit is will depend on the policy of the gas undertaking, but provided the ash is (*a*) in a finely subdivided condition and (*b*) in an infusible form, quantity is a secondary consideration for closed stoves.

This conclusion indicates that, other things being equal, the melting point of the ash may be the deciding factor in the choice of a gas coal, and this is a point to which but little attention is paid on most gas-works. A second conclusion is that when the coke is intended for closed stoves, the coal should always be crushed before carbonizing, to ensure that the ash shall be finally divided. It is well, indeed, to screen the gas coal before carbonizing and to carbonize the fines, below ¼ in., in horizontals or by an intermittent system, the coke produced being set aside for use in closed stoves.

Quite different conditions exist in the open grate. Here the possession of free-burning characteristics is of more importance, and the fire is generally allowed to die out at night to be re-lit after cleaning next morning. Large pieces of ash sink through the fire to the grate and remain there. Being large they do not encumber the bars or block the draught, they protect the firebars, and, by their insulating action may even assist the fire to remain in when it burns low. For the open fire there is no objection to "bats" or to a certain amount of clinker, provided the clinker-forming propensities of the coke are not too marked. The presence of some iron in the ash may actually assist combustion by increasing the combustibility of the coke.

Where ash is definitely deleterious is when it is very fine in grain size, and where it is large in amount. Nothing spoils the appearance of a coke fire so much as to see every piece of half-burned coke covered with ash. The combustion is retarded, the fire looks "dirty," and the user, who really judges by appearance and not by efficiency tests, is dissatisfied. The use of dirty, crushed coal for making fuel for the open grate is greatly to be deprecated. The second disadvantage of fine ash is in the extra amount of cleaning that it entails. The writer has frequently heard the complaint that coke is "dirty"

because everything in the room is covered with a film of dust, which is absent when coal is used. On investigation this was traced to the finely divided state of the coke ash, which during the cleaning of the fireplace in the morning was carried in suspension in the air and subsequently settled on the chimney-piece, furniture, polished surfaces, and so forth, to the great discouragement of the ladies of the household. When making coke for the open grate, therefore, the coal should be as low as possible in "inherent" ash—generally very fine in size—and should be carbonized in lumps (nuts, &c.) to ensure that any dirt left in shall be in "bat" form and shall not be crushed and distributed throughout the coal. The large material screened as described in the earlier section of this article may therefore be set aside for the manufacture of coke for open grates, preferably by some form of continuous retort.

Upon this view, the form of the carbonizing retort and the methods adopted will in the future be decided by the use to which the coke is to be put. The difficulty is that the gas company frequently has to supply "coke" without knowing exactly for what purpose it is to be used. This is where "marketing" begins, and that is another story. Judging from the experience of certain companies there seems to be no particular reason why an open-grate product should not be manufactured and sold specifically for that purpose; it might even encourage the sale of the open-grate coke to charge a little more for it. But that is a matter of psychology, and that also is another story. There is much more behind the sale of gas coke than would be suggested by Dr. Lander's remark that it must be dry, clean, and screened. The fact of dryness is not absolutely essential for a closed-stove coke, particularly if a gas poker is used for lighting the fire. For the open-grate product, the provision of driers might even be considered. Everything possible should be done to promote the sale of gas coke; it is no use selling gas if the coke has to be stored or given away.

Gas in the Pottery Industry

The use of gas for pottery firing was the subject of an interesting address by Mr. A. Mackay, Chief Engineer and General Manager of the City Gas Department, at a meeting of the National Council of the Pottery Industry, at Stoke recently.

Mr. Mackay said that in actual practice it had been found that with the adoption of gas firing, the production had been speeded up, furnace temperatures and atmospheres could be controlled, the wear and tear on kiln mouths, saggars, and refractories generally was negligible, and there was a considerable reduction in the percentage of rejects. Further, by the use of the gas-fired oven, he said, a small order for goods could be completed in three days—a considerable saving in time. Another advantage stressed was the elimination of wasteful smoke.

At the outset of his address, Mr. Mackay pointed out that in many industrial areas where development in the use of gas is proceeding rapidly, town gas is now being used in preference to other forms of fuel for large-scale industrial heating processes, two important advantages being:

(1) Town gas is essentially a fuel which can be efficiently burned under controlled conditions and so makes available a very wide range of atmospheres within the working chamber.
(2) Owing to the high flame temperatures which can be obtained, it is possible to transfer heat very rapidly to the load. This condition is essential where a particular heating operation demands a high rate of throughput. But, further, owing to the relatively high thermal capacity of the air used for its combustion, the working temperatures can be elevated by simple recuperation.

Other reasons for the increased use of town gas for heat treatments were summarized by Mr. Mackay as follows: (1) It is essentially a fuel which can easily and completely be burned in burners of simple construction. (2) The combustion of gas so burned is under complete control, so that any desired furnace atmosphere may be obtained. (3) Owing to the air-gas ratio being high, the regeneration of waste heat by the air used for combustion is a relatively simple matter. (4) Low sulphur content results in furnace atmospheres being free from contaminating gases. Average sulphur in coal, 3·04%; in fuel oil, 1·58%; in producer gas, 1·5%, depending on quality of coke used; in town gas, 0·04%—all by weight. (5) Simple control of temperatures and furnace atmosphere. (6) Floor space of furnaces reduced, no chimney required, and capital expenditure reduced. (7) No handling of original fuel or residue. (8) Elimination of smoke. (9) Maintenance cost of furnace very much reduced. (10) Town gas is a fuel of constant composition, and consequently this simplifies the maintenance of constant and uniform temperatures. (11) Less damaged or scrapped material, as a result of imperfect heat treatment.

Production Costs.

In attempting to arrive at a comparative cost of town gas and any other fuel, it is necessary to take into consideration the all-in costs of production, and not simply the cost of fuel. In most cases it will be found that the use of town gas as a fuel effects considerable indirect savings, and often a more complete investigation into the economies of a particular heat treatment operation will make it quite apparent, having regard to the all-in costs of production, that town gas is more economical, and offers many advantages.

For instance, it will be obvious that as the bulk of the oven space is occupied by protective material, a large proportion of the heat is also taken up by that material so that the efficiency of the firing operation in relation to the amount of ware treated is exceptionally low. The efficiency of the intermittent type of solid fuel-fired kiln is in the region of 5-10%, and the speed of the heating operation is also of a low order.

With the gas-fired oven, the use of saggars is in many cases rendered unnecessary. Bats and props have a much longer life than the saggars, and cost considerably less in proportion to the total amount of material they can support during their "life."

Other and much more important advantages, however, accrue from the use of bats and props instead of saggars, of which the following are some:

(1) The weight ratio of bats and props to ware has been reduced to 1: 1, compared with 10: 1 ratio when saggars are used. Thus more ware can be fired at one time in a given oven space.
(2) Considerably less fuel is wasted in heating up the light supporting material, than in heating saggars.
(3) The ware is heated uniformly, accurate temperature control throughout the working space being relatively simple.
(4) The ware is heated more quickly.
(5) The goods are not discoloured, as was sometimes the case when they were packed in sand.
(6) By the adoption of gas-firing, coupled with the use of bats and props, the two firing operations (involving two loadings and two unloadings) which were necessary when solid fuel was used, have been carried out satisfactorily in one stage.

The above advantages alone would justify serious consideration of the question of substituting gas for solid-fuel firing, even if the fuel costs of gaseous firing per article produced were higher than those of coal-firing.

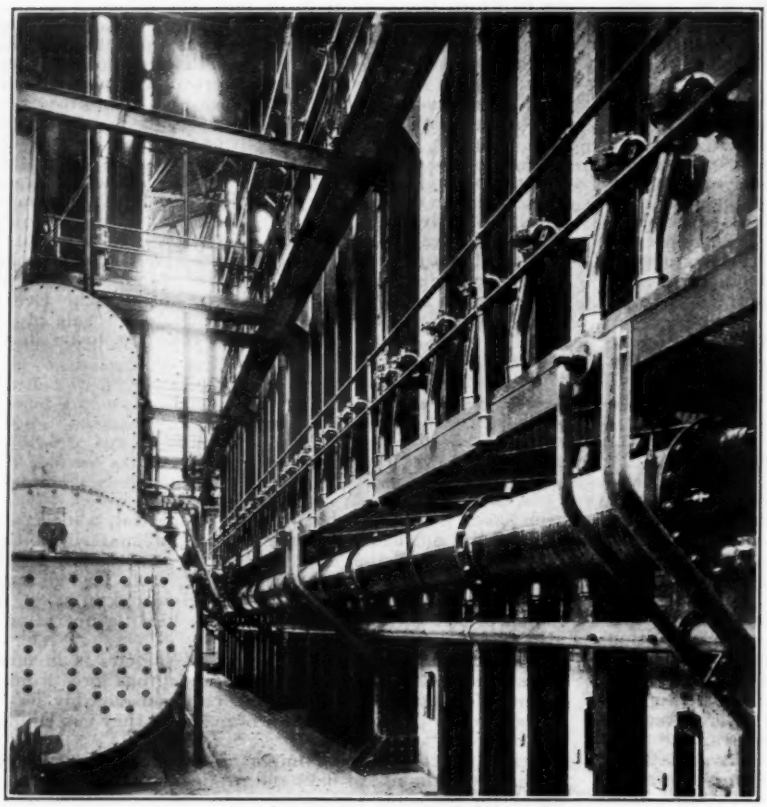
In a particular factory, however, where electrical porcelain goods are mainly produced, the coal-firing costs amounted to about 7½% of the selling price of the articles. Since the introduction of one-stage gaseous firing by town gas, the firing costs have been reduced to between 4½ and 5% of the selling price.

This result is due not only to the high efficiency of the gas-fired oven—about 30% compared with about 5-10% in the case of the coal oven—but to the fact that the number of "rejects" has been reduced by at least 50%, and the proportion of first quality ware increased.

In this connection it should be mentioned that much the greater proportion of the total cost of most pottery ware is represented by materials and labour prior to firing. Any system of firing, therefore, which reduces the percentage of rejects, also reduces the cost per article produced. The extent of the savings thus effected will vary, of course, and will depend on the value of the labour and material used in the making of the goods.

Quick Completion of Small Orders.

While recognizing all of these advantages, it is pointed out that one of the most important results achieved is the considerable shortening of time now taken in executing an order. Pottery goods are not as a rule made for stock, but to order. Much may, therefore, depend on the speed with which a batch of goods can be made and despatched. To-day, by using the gas-fired oven, a small order for goods can be completed in three days. With the older methods up to 14 days were frequently taken.



RECUPERATOR SIDE OF THE PLANT SHOWING PRODUCER GAS MAIN AND WASTE HEAT BOILER.

C.O.L. VERTICAL CHAMBER PLANT AT VANCOUVER

A number of government, municipal, and company officials were present recently when Mr. L. D. Taylor, Mayor of Vancouver, B.C., inaugurated the new 3 million c.ft. per day installation of C.O.L. vertical chambers at the Carrall Street Works of the British Columbia Power Corporation, the Chief Gas Engineer of which is Mr. John Keillor. Reference to this plant was made in the "JOURNAL" for March 22 last.

Gas consumption has increased at an extremely rapid rate in Vancouver during the past 40 years, and in anticipation of further progress the new works have been laid out so as to allow of extension to an ultimate gas-making capacity of 20 million c.ft. per day. The site is six acres in extent and has a 375 ft. wharf frontage, the coal being delivered by barge or alternatively by rail car.

The first section of the gas-making plant which has just been completed by Messrs. Gas Chambers and Coke Ovens, Ltd., of Artillery House, Westminster, comprises 24 chambers, each of 4·2 tons capacity (with outside mechanical producers) and is capable of carbonizing upwards of 170 tons of coal per day. The contract also includes coal and coke handling plant, the arrangements for which have been carefully planned. The coal from barge or rail car is grabbed by electric jib crane and delivered into blending bunkers or to yard storage. Three blending bunkers of a total capacity of 250 tons deliver the coal by way of rotating feed tables on to a collecting belt conveyor. Thence, by way of an automatic weighing mechanism, followed by bucket elevator, the coal reaches the storage hoppers over the chamber plant. The conveyor plant has a capacity of 80 tons per hour and can thus carry out all coal operations for one day's supply in four hours. The storage bunkers hold a 48 hours' supply of coal and 24 hours' supply of coke breeze.

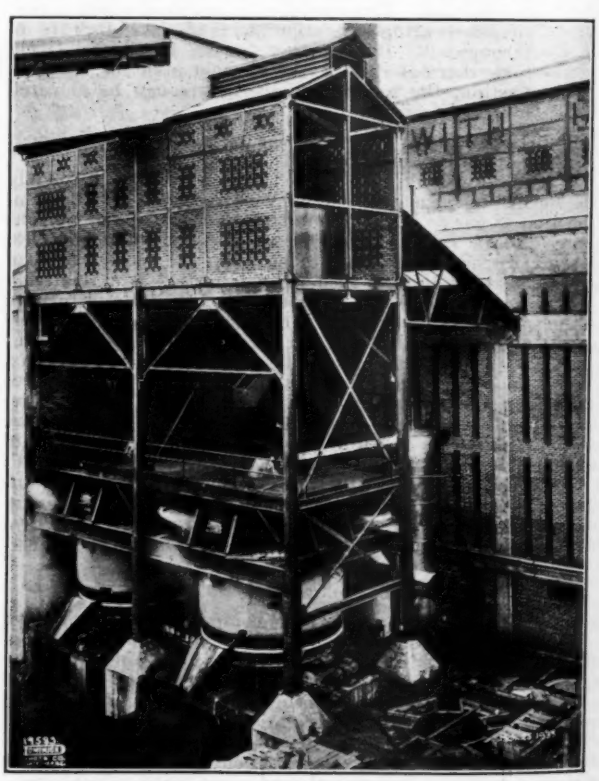
The chambers are charged by an electrically-driven car, which delivers the correct amount of breeze and coal to the chambers, and is so designed that not only is an incorrect sequence of operations impossible, but it is also unnecessary to move the car between the coal and breeze charging operations. When carbonization is complete, the coke is discharged instantaneously into an electrically-propelled hot coke car, and the coke is thereafter evenly quenched under a tower with a measured volume of water.

The 24 chambers, which are built in four settings of six, are heated by means of clean, cold producer gas, generated from low-grade fuel in fully mechanical producers of the Lymn-Rambush type. These are steam boiler jacketted and are followed by waste-heat boilers. All dust is removed from the producer gas by means of two Lymn gas washers followed by centrifugal fans. The settings are partially recuperative both for air and gas, but a waste-heat boiler is installed between the recuperators and chimney.

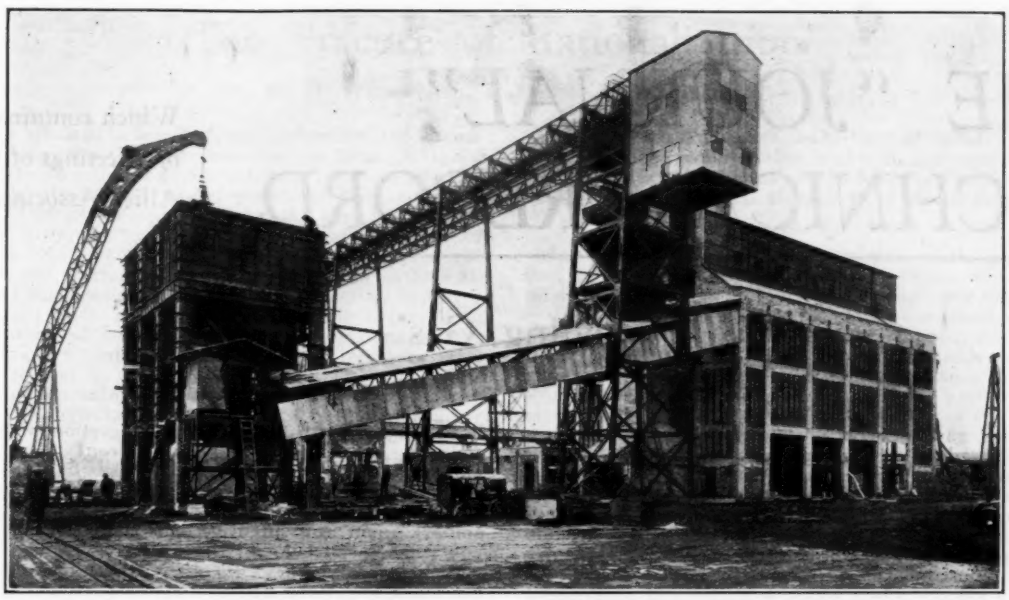
The decision to install mechanical producers in place of hand operated producers was owing to the desire to gasify all breeze made and the high ash content of the coal, which made clinkering in the latter case laborious and expensive.

SPECIAL FEATURES OF PLANT.

The C.O.L. chambers have several special features, among which may be mentioned the multiple combustion



Mechanical Gas Producers.



GENERAL VIEW OF 3,000,000 C.FT. VERTICAL CHAMBER PLANT WITH COAL HANDLING AND BLENDING PLANT FOR 6,000,000 C.FT.

flues extending to about one-third the height of the chamber wall. These ensure the maintenance of a moderate temperature gradient between bottom and top of the wall as compared with types having only one combustion flue; in other words, they provide a high average wall temperature while at the same time permitting a moderate maximum temperature.

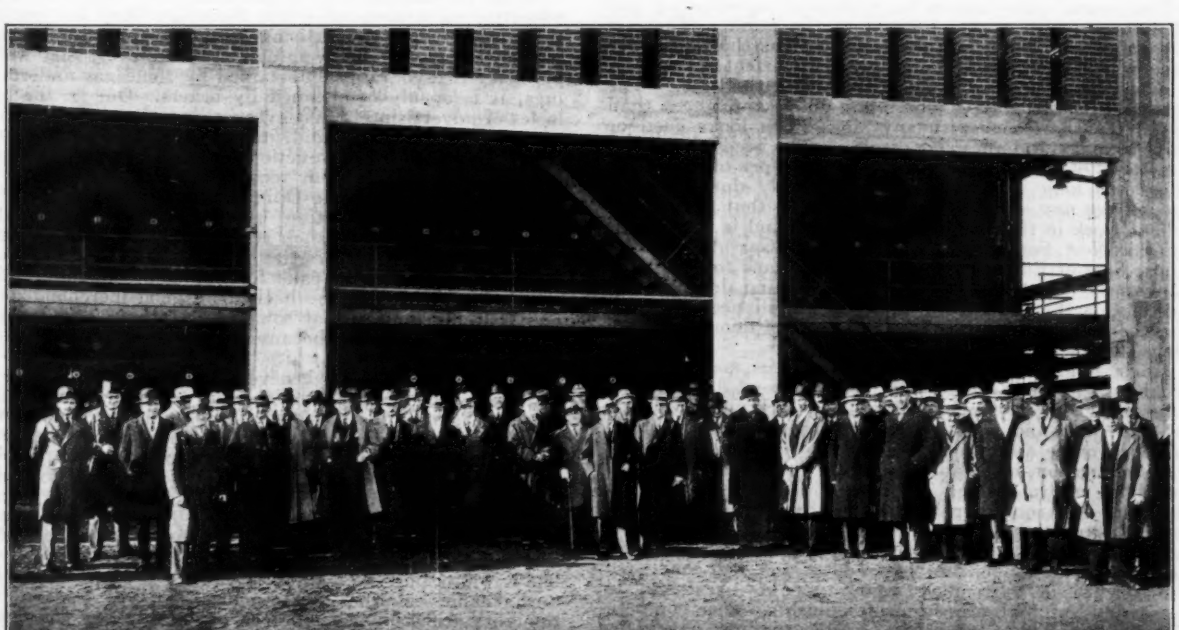
Top and bottom gas offtakes of patented design are incorporated in the plant and the steaming equipment, also patented, gives an even distribution of steam, thus ensuring high efficiency and maximum thermal yields of gas.

Carbonization proceeds steadily to completion without any movement of the charge whatsoever. In this way an improved quality of coke results, and the yield of small coke and breeze is correspondingly reduced.

The type of plant installed was selected after careful survey of the possibilities with a view to utilizing the local coals of British Columbia, and in this connection it is noteworthy that the Hon. W. A. McKenzie, Minister of Mines, at the inaugural luncheon, said: "The establishment of this plant means 'keeping the home fires burning.' It is the duty of every resident of this province to consume as much coal as possible, and this plant will certainly do its part in aiding our coal industry." The plant has now been in successful operation for three months on these coals, and the results in all cases have exceeded expectations, over 95 therms per ton of 465 B.Th.U. gas being obtained from a blend of the local Vancouver Island coals as delivered. Investigations are at present taking place in collaboration with the Ottawa Fuel Research Board on various blends of coal, and it is hoped to publish full details of the results when these have been completed.

It is noteworthy that a further contract for an additional twelve C.O.L. chambers recently placed will increase the consumption of coal from local collieries by an additional 35,000 tons to 105,000 tons per year.

Erection of the plant was commenced in November, 1931, with the driving of about 1000 piles to carry the various foundations, and the inaugural ceremony took place on Jan. 31, 1933. Speakers at this function, in addition to the Mayor and the Hon. W. A. McKenzie, were Mr. W. J. Murrin, President of the British Columbia Electric Power and Gas Company, and Major Harold Brown, President of the Vancouver Board of Trade.



GROUP OF GUESTS AT THE INAUGURAL CEREMONY.

THE "JOURNAL" TECHNICAL RECORD

Which contains Reports of Meetings of Gas and Allied Associations

Selling Gas*

By A. Vivian Meldrum.

As no two gas undertakings possess identical requirements in regard to selling, no stock or standard scheme can be laid down. Modern selling, however, is based on well-known principles, and it is by applying some of these in their entirety and adapting others to suit the special needs of the undertaking that an efficient selling scheme can be evolved. Policy is the very backbone of a sales campaign; consequently it is necessary at the outset to formulate a selling policy which is sound and progressive and possesses those elements of modernity which bring it right into line with present-day requirements. Rounding off a policy so that it fits in with the existing scheme of things gets nowhere, because it is over-ridden by considerations which are divorced from modern methods of selling. First establish your policy and then build the sales structure around it. A good selling policy is of little value unless it is translated into action and, for this purpose, an up-to-date and efficient sales organization is needed. To obtain the best results it is submitted that the following are necessary:

Efficient Appliances.—Products which meet a public need faithfully, measure up with the claims made on their behalf, represent sound value, do their work efficiently and economically, and are either better than, or compare favourably with, competing products.

Modern Facilities for Selling.—Up-to-date and well-equipped showroom, capable staff, modern service arrangements.

Complete Market Data.—Appliances in use, number, type, by whom used, &c. Classification of uses in groups according to districts, zones, or customers. Information as to trends, movements, or tendencies in demand and use of gas. Similar data regarding competitors should also be obtained if possible.

Publicity.—Advertising, propaganda, showroom and window displays, lectures, demonstrations, model rooms, exhibitions, &c.

Too much care cannot be exercised in selecting gas appliances which are to be sold to the public. There is not a more damaging advertisement to gas than an appliance which is "jerry" built, gives inefficient service, or is a continual source of dissatisfaction to the user. Far better is it to handle a dozen top-notch appliances than to fill the showroom with anything which looks good or helps to make an impressive display. The need for definite standards of efficiency and safety in all types of gas appliances has long been recognized, but only during recent years have any steps been taken to meet that need. Excellent work in this connection has been and is being done by the New South Wales Commercial Gas Association, whose Seal of Efficiency is now the hallmark for good gas appliances. As the result of the work being done by this Association the standard of many gas appliances has been raised, and, on the other hand, the seal of doom has been placed on inefficient and unsafe appliances.

Much might be said about showrooms, as, generally speaking, they fall a good deal below present-day requirements. With very few exceptions they lack pulling power, are too drab and uninteresting to invite inspection, and fail to provide anything which "hits" the eye, intrigues the imagination, or whets curiosity. They need modernizing, both externally and internally. The real meaning of the word showroom appears to have been overlooked—unless, of course, the word showroom may also mean storeroom. Showrooms cost a good deal of money both to build and to maintain, but an up-to-date and well-conducted showroom is a particularly good type of investment in these days of high-pressure salesmanship, keen competition, and a hard-to-sell public. Show windows should be made worthy of their name, and every opportunity should be taken to illustrate, by direct suggestion, what the Gas Industry has to offer in terms of convenience, comfort, money saving, work saving, &c.

The merchandizing expert says, "Know your market, and find out who and where your prospects are, before you embark upon any intensive scheme of selling—otherwise you will expend a lot of time, effort, and money and get very little in return." In other words, make a survey of the market, get the figures and facts regarding your own sales and also those of competitors, and sort out your information in such a way that you will know what appliances are in use, by whom they are used, and where your opportunities for selling may lie.

National Advertising.

There are some who believe that an extensive and intensive national gas advertising campaign—consistently carried out—would produce worthwhile results. With that opinion I do not entirely disagree, provided that the industry is (*a*) willing to finance the scheme; (*b*) in a position to carry it out effectively, and (*c*) in a position to derive full benefit from it. It is my considered opinion that, until far more cohesion is shown by the Industry as a whole, something approximating a uniform sales and service policy is formulated and applied, and employee education is efficiently carried out, national advertising would be not only a costly experiment, but also a dangerous pastime. National advertising is justified by a policy of singleness of purpose; it stands on a foundation of co-operative endeavour and it is sustained by a system of mutual goodwill. It is a powerful ally when properly conceived, skilfully directed, and used under suitable conditions, but it is likely to be a dangerous plaything if it is experimented with.

Local Advertising.

While the Industry as a whole is quite unprepared to advertise on a national scale, there are very few undertakings in which advertising cannot be profitably employed. It is extremely unfortunate, however, that while publicity is favourably entertained by some gas undertakings, it is openly condemned by others. One of the fallacies of advertising is that every man can write advertisements. On the other hand, its true meaning is often misinterpreted and its real functions are misunderstood. However, advertising does not require Counsel to plead for it before the Bar of Public Opinion, for it has provided its own economic justification by demonstrating that the lowest-priced articles in their respective classes are the ones most largely advertised. Gas is very much under advertised, and the position calls for immediate action. But good advertising must be backed by good merchandizing, and it would appear that some undertakings at least are not ready to advertise because of the absence of a sound merchandizing scheme.

It is noticeable that whenever gas is advertised there is a tendency to expect too much from the advertising. Advertising is only one phase of selling, and it is not by any means the principal phase. Strictly speaking, its primary function is not to sell goods, but to promote thought habits—to make people think along definite lines, and to make them think they are thinking for themselves. Having done this, it will create an urge to buy. The more important task of actually selling the goods rests with the sales staff.

The Gas Industry needs optimists—needs them badly—but it wants only men whose optimism is grounded on an unshakeable belief in the potentialities of gas; whose thoughts are fashioned more on the events that lie ahead than upon the incidents of yesterday, and whose principal joy in life comes from doing a tough job well and inspiring others to loftier achievements.

* From a paper at the Sixth Convention of the Australian Gas Institute.

The Practice of Rationalization*

By H. Wadsworth, Harrogate Gas Company.

Under an efficient scheme of rationalization the manufacture of gas would be concentrated in large stations. In view of the fact that a grid scheme on the lines adopted by the electricity industry was reported as impractical by the Special Committee appointed by the Gas Industry, I would not presume to suggest the standardization of quality, but I cannot help feeling that in this respect our competitors are scoring over us. We complain with justification that the freedom allowed to the electrical industry in the conduct of its business is not similarly extended to our own Industry, but there is the provision under the Board of Trade Regulations (Electric Lighting Acts, 1882 and 1888), Section B, which reads as follows:

"Before commencing to give a supply of energy to any consumer, the undertakers shall declare to that consumer the *constant* pressure at which they propose to supply energy at his terminals. The pressure so declared shall be constantly maintained subject to,

"A variation not exceeding 4% above or below the declared pressure under any conditions of supply which the consumer is entitled to receive."

This has no counterpart in the legislations affecting the Gas Industry—otherwise I consider that the efficiency of gas distribution would be far higher than it is to-day.

The distribution of gas would be in the hands of large supply companies or corporations each owning its own manufacturing plant or taking its supplies from coke ovens. These companies or corporations would be formed by the amalgamation or absorbtion of neighbouring undertakings. I do *not* consider that the mere concentration of manufacture alone and distribution in bulk to the existing gas companies would be of much practical good.

The Harrogate Gas Company.

On Jan. 1, 1928, after previous negotiations the Harrogate Gas Company acquired the gas undertakings of the Knaresborough Urban District Council, the Tadcaster and Wetherby Gas Company, the Boston Spa Gas Company, and the Boroughbridge Gas Company.

Previously, in 1925, the undertaking of the Pateley Bridge Gas Company had been purchased.

The combined output of these undertakings at the date of transfer was approximately 90 million c.ft. per annum.

The size of the merger may not seem great considered in output, but I submit that the smaller the undertaking the greater the need for absorption. What is important, however, is the fact that the area of supply of the Harrogate Gas Company became 193 sq. miles, with a distance across from N.W. to S.E. of 29 miles and N.E. to S.W. of 17 miles.

The actual linking up of the purchased undertakings with the works of the Harrogate Gas Company involved the laying of 25 miles of additional high-pressure steel mains.

It is not within my province to deal with the actual economics of the undertaking, and I propose to confine myself to a brief description of scheme of supply.

The distribution system in Harrogate itself follows the usual lines, one 24-in., one 12-in., and two 6-in. mains forming the main feeders into the town. Cast-iron mains with turned and bored joints are used throughout our low-pressure system. At the works two "Waller's" 50,000 c.ft. per hour reciprocating compressors are installed. A 6-in. steel main with long sleeve-welded joints leaves the works as the trunk high-pressure feeder. From the main which circles one side of the town connections are made at four points to the low-pressure mains through "Reynolds" 4-in. governors, set to come into action when the pressure in the town mains falls below a pre-determined amount. In the larger portion of Harrogate we maintain a pressure of 5 in. water gauge. The high-pressure mains were all tested when laid to a pressure of 50 lbs. per sq. in. The actual pressure carried varies according to the time of the year, being at present 5 lbs. per sq. in. from April to September, 6 lbs. in October, 7 lbs. in November, 8 lbs. in December, 8 lbs. in January, 7 lbs. February, 6 lbs. March. If necessary, and with the existing plant, these pressures could be increased to 25 lbs. From the high-pressure trunk main two connections are taken, one to supply the Wetherby-Tadcaster section and the other to supply the Knaresborough-Boroughbridge section. The main supplying the first section is of 6 in. diameter to Wetherby, a distance of nine miles from the Harrogate Works, 5 in. diameter forward to Boston Spa, four miles, and 4 in. forward again to Tadcaster, a further 4½ miles. The main supplying the second section is of 5 in. diameter to Knaresborough and 4 in. diminishing to 3 in. forward to Boroughbridge, a distance from Harrogate of eleven miles.

Storage Capacity.

The existing holders at the various works play a very important part in the design of the system, and full use is made of the storage available. Although our high-pressure system was designed on the assumption that no holders were available so as to allow a safe margin for eventualities, actually the use of the holder enables a much lower pressure to be carried in the high-pressure mains than would otherwise be the case. In our own case the requirements of the maximum hour are one-ninth of the maximum day, so that assuming a 24 hours' capacity in the holder the capacity of the main feeding need be only one-third of that necessary if no holder were available and the district fed direct. We had, of course, holders available at all the stations taken over, and branches were taken from the high-pressure main to feed these holders. The supply into each holder was controlled originally by a suitable valve, but with a view to reducing the attention required it was found desirable to fit automatic controls. A control valve supplied by Messrs. Bryan Donkin Company, Ltd., was adopted, operated by the action of a weight caused to descend on to the valve plate when the holder is full. The actuating gear consists of a wire rope passing over a pulley and carrying at each end a weight, the heavier one being lifted by the holder and causing the smaller one to fall on to the control. A travel of only about 1 ft. is necessary, but provision has to be made to prevent the weight banging against the holder side in wild weather.

This method is suitable for guide-framed holders but not for spiral holders. For the latter due to the lateral motion a different type of operating gear is used, consisting of a lever pivoted on a fulcrum placed within 6 in. of one end, the pivot itself being free to revolve. The long end of the lever rests on the cup of the holder, and from the other end is hung a wire rope carrying the weight to operate the automatic valve. The lever is carried vertically and horizontally by the lifting of the holder, but travel is reduced at the valve end due to the position of the pivot, and by means of a guide the weight can be maintained vertically over the valve. These control arrangements have functioned entirely satisfactorily.

The holders have continued to supply their respective districts exactly as before gas-making ceased. In certain cases, however, we have installed governors feeding from the high-pressure main into the low-pressure system at convenient points, as in Harrogate, to reinforce the supply at points remote from the holder and iron out any variations in pressure. At the same time as the mains were laid for linking up, tappings were taken off *en route* to supply intervening and adjacent districts.

Governors.

Some fourteen villages and newly developing areas are fed direct from our high-pressure system through suitable governors feeding into a small local low-pressure distribution system. In every case these governors are fitted into kiosks above ground, each being provided with by-pass, inlet and outlet valves, and dial reading pressure gauges, high-pressure and low-pressure. I strongly recommend the fixing of all governors above ground. Apart from the greater safety to men employed, the cost of maintenance is less, due to the fact that less elaborate precautions are necessary when the governor is being worked on; the governor receives better attention, due to its greater accessibility, and can be kept in better decorative condition. There is no danger of flooding, and the kiosk does not become a nuisance in the sense that an underground chamber does. It has been my experience that at intervals an underground chamber has to be scraped and washed down with disinfectant and that in time the brickwork of the chamber itself becomes somewhat unsavoury.

Isolated houses, farms, &c., on the route of the high-pressure mains are given a supply through separate house service governors. These, as are all high-pressure governors used on the system, are of diaphragm type. Our usual practice is to fit the governor in a pre-cast concrete chamber sunk into the ground at a point near the house. The use of a pre-cast chamber enables all necessary materials to leave the shop together, and does not necessitate the services of a bricklayer. It makes a tidier job than the usual brick chamber and is impervious to water.

* From a paper before the Yorkshire Junior Gas Association, April 22.

A safety blow-off pipe is attached to the governor and carried to a convenient point, arranged to blow-off when the pressure exceeds 8 in. I heard of one undertaking which fixed high-pressure governors in the cellars of houses without a blow-off pipe taken outside the premises, but I do not consider this a safe practice.

A small piece of dirt on the seating would allow the full pressure to go through to the internal house fittings and meter, and there are not many installations I would care to put under 8 lbs. per sq. in. pressure. As I said before, all high-pressure mains are of steel, double-wrapped and coated, with long sleeve-welded joints.

Oxy-acetylene was used for the welding, and the method was to keep one end above ground and weld the pipes on trestles across the trench. The length laid per gang per week averaged 500 yards and two separate tests were applied, the joint test and the " standing " test, each at 50 lbs. per sq. in. air pressure.

High-Pressure Holders.

At our Boroughbridge Station it was found necessary to re-sheet the existing holder about three years ago. Various methods of maintaining the supply while the work was being carried out were considered, and finally it was decided to put down a small compressing plant and high-pressure static holders, with the idea of increasing the storage capacity available at Boroughbridge and of tiding over the emergency.

The chief reasons influencing our choice were:

(1) A gasholder would have been somewhat unsightly in the position available, whereas the dish ended containers could be practically hidden.

(2) That high-pressure storage at Boroughbridge could be made to fulfil a very useful function in relation to the high-pressure distribution system—*i.e.*, provide a small storage reserve in the same way as a gasholder does for the low-pressure system.

It was not intended that the plant should function over the 24 hours as does a holder, but only that it should take the peak load on its own high-pressure section. Also—a very important advantage this—if it were necessary for any reason to isolate a section of the high-pressure main, the supply could be maintained to both sides of the isolated section. As five villages are supplied direct through governors and without storage, from the main supplying Boroughbridge the importance of this arrangement is obvious.

The provision of the additional compressing was not of great importance, as only a small quantity of gas is actually drawn from the containers, and it is only necessary to compress twice per week, whereas a corresponding saving is effected in the original compression cost due to the peak load not having to be carried on this section. Otherwise this would necessitate a higher pressure being carried in the entire high-pressure system at peak load period to meet the requirement of this section only, which suffers from the fact that a very heavy supply is taken from its high-pressure feeder main prior to leaving Harrogate to maintain the pressure on a low-lying heavily populated district of Starbeck.

Compressing Plant.

A brief description of the plant and the mode of its operation may be of interest. The compressing plant consists of two Bryan-Donkin compressors designed to run either singly or together and belt driven from shafting, the motive power being a 16 B.H.P. gas engine which was available. The capacity of each compressor is 3000 c.ft. per hour at 50 lbs. per sq. in. The storage consists of two dished end containers each 30 ft. long by 9 ft. diameter built of $\frac{3}{8}$ in. and $\frac{7}{16}$ in. plate and tested. The storage capacity at 40 lbs. per sq. in. is 10,176 c.ft.

The pressure is prevented from building up beyond this figure by a relief valve which returns any excess to the inlet side of the compressors and at the same time causes a bell to ring in the foreman's house on the works.

During the progress of the repair work to the gasholder, the containers were filled during periods of low consumption to 40 lbs. per sq. in. The gas was passed out on to the district through two Bryan-Donkin diaphragm governors working in sequence, the first or intermediate governor breaking the pressure down to 5 lbs. per sq. in. and the second governor reducing this to 4 in. water gauge. After completion of repairs to the holder the supply to the town was again driven on the normal way from the holder, and the high-pressure containers were used as a balance weight, if I may so term it, on the end of the high-pressure system. The containers are filled approximately twice per week at periods of low consumption and, by a suitable arrangement of the connections and governors, discharge back into the high-pressure main when the pressure in that main falls below 2 lbs. per sq. in.; so what happens is that the containers are to the high-pressure system what a holder is to the low-pressure system, with the exception that they only function for short periods each day to meet the peak demands. The plant is automatic in operation, apart from the filling. If it is desired to feed Boroughbridge direct from the high-pressure system without recourse to the holder, by operation of the valves the inlet gas from high-pressure main passes through the second governor only, and is broken down to 4 in. W.G. If the high-pressure inlet pressure drops below 2 lbs. per sq. in. the intermediate governor opens and allows the containers to feed. In this case also the operation is automatic and the containers merely take up the peak, although, of course, they would automatically function in case of failure on the high-pressure feeder.

Attaching Services.

Our method of attaching individual services to the high-pressure mains is by means of Mueller clasps. A much smaller service pipe is necessary, of course, than with the low-pressure service, and with the object of keeping the cost of the service as low as possible we carry the high-pressure pipe and fix the governor as near the house as possible. It is not, of course, desirable to go below $\frac{1}{2}$ in. in size of pipe, as allowance must be made for any corrosion and gradual deposit which may take place. A much smaller hole is drilled in the main than the size of the service pipe attached. This has two advantages. It enables the hole to be drilled through the plug of the tap which is attached to the clasp reducing the risk in making the connection; secondly, it reduces the quantity of gas escaping in the event of damage to the service. In the case of an ordinary house the hole put into the main is $\frac{1}{8}$ in. in diameter. Special high-pressure cocks are used, two on each service, one immediately adjacent to the main and the other on the governor inlet. The ordinary main cock is used on the meter inlet. We have found it necessary to bare the wrapping from the main before attaching the clasp, afterwards making good. Where this is not done, leakage has been found to develop later after the job has been left perfectly gas-tight, probably due to the resiliency of the wrapping gradually suffering under the pressure of the clasp.

Systematic inspection is given to all apparatus on our high-pressure system. A specially trained fitter carries out this work and rides a motor cycle and box combination. Syphons are blown each month, the 4-in. town governors are inspected weekly in winter, monthly in summer, and completely dismantled twice per year; district governors are overhauled monthly, and consumers' governors twice per year. All valves are regularly turned once each month. A tank can be fitted into the box of the motor cycle for emptying the high-pressure syphons, and the condensate can be blown straight in, due to the pressure carried in the main.

I may say that we have not experienced any failure on any part of our extensive high-pressure distribution system, giving a supply of gas to some 5000 consumers in the outer areas, apart from a governor occasionally blowing at the safety vent due to foreign matter getting on the valve seating. During the recent heavy snowstorm when parts of our district were temporarily isolated no part of the equipment failed to function.

I would express my conviction that successfully to maintain our position the distribution of gas must be put on a somewhat higher plane, and a definite effort made to supply the consumer with his commodity at a constant pressure. In very few low-pressure systems can this be said to obtain, as the size of mains necessary for normal requirements is not sufficient to maintain the peak load without pressure drop. Although the peak is of comparatively short duration it is the period when most inconvenience is caused to the consumer by pressure variation, and it gives rise to complaints of " bad gas," &c. The only satisfactory system appears to me one in which, by one of the various methods, gas is available at a pressure higher than that required by the consumer, to feed into the supply mains at convenient points remote from the gas-works to take the peaks of consumption.

Such measures as the loading of the station governor and boosting are not proper methods of dealing with peak loads.

Discussion.

The President (Mr. J. W. Wood) said the meeting had heard a paper of interest on a subject of great concern.

Mr. Ralph Halkett (General Manager of the Sheffield Gas Company) said the Junior Gas Associations were doing excellent work, and ever since he was one of the Yorkshire Juniors he had followed the Transactions and activities of that organization with interest. Rationalization was a subject of great importance in modern industry, and the author had dealt with it, in its application to a gas undertaking, in an able manner.

Rationalization was a policy on which there were widely diverse opinions as to its benefits. It was undoubtedly beneficial if its primary object was to give a better service to the consumer. That was the aim and object they were trying to carry into effect in the Gas Industry; but one was afraid it was a thing which could not truly be said of all instances in which rationalization had been applied and where the objective was quite obviously to create a greater profit-producing monopoly. He (Mr. Halkett) felt that rationalization could be made a very good thing for the Gas Industry, because isolated small undertakings often had to work under serious disadvantages which could be avoided by linking up with the wider experience and greater financial backing of bigger undertakings. One of the general fears about rationalization was that of the manager of the small undertaking and his anxiety about losing his job. As a matter of fact, there was no need for any manager to lose his job. In the small undertaking the distribution and sales side of the business could never be cultivated on the studied and scientific lines necessary to-day, and there was any amount of scope for the appointment of the former local undertaking manager to a position of responsibility in the development of that side of the amalgamated undertaking in his own area. One of the factors which the Gas Industry was gradually coming to realize was that the outside department was quite as important as the manufacturing side—in fact, one sometimes wondered whether it was not even more important, because there was little use in developing manufacturing efficiency if the selling organization was defective.

The author, proceeded Mr. Halkett, had mentioned electricity. They all knew, of course, how strong a leaning the Government had shown towards electricity, and it was all the more necessary, therefore, that everybody engaged in the Gas Industry should utilize every possible way of keeping gas to the fore in public service. Personally, he had no fears as to the future of gas. Despite all the advantages which electricity had been given by State concentration on that industry, the prospects for gas were brighter than ever before. All over the country gas undertakings were able to report increased business, despite the industrial depression. They in Sheffield, in spite of the fact that their area was one of the most badly hit by the depression, were showing a steady and substantial increase year by year. To his mind the Harrogate Gas Company were to be congratulated on the ideal rationalization system they had brought into operation in their widespread distribution area.

Mr. B. THORPE (Huddersfield) congratulated Mr. Wadsworth on having, in effect, put before the meeting the gas grid ideal on a small scale. It seemed to him that what had been done at Harrogate could be done with advantage all over the country. He would like to ask if Harrogate had experienced any trouble with their static holders. Mr. Wadsworth had mentioned using a rubber ring in the long-sleeved joints, and one would be interested in more detail as to what was the particular advantage in that procedure. With regard to the syphon pots, what would be the size of the pots on the 5-in. high-pressure main, and what amount of condensation were they getting on that main?

Mr. J. W. HOLROYD (Rotherham) said Mr. Wadsworth had mentioned fixing a valve every 1000 yards on the high-pressure main, and that these were released at least once per month. That looked feasible enough on the Boroughbridge section, where they had the static holders, but how was it to be applied on the other sections, where supply was direct from the high-pressure main, without affecting supply?

Mr. S. T. S. MUSGROVE (Sheffield) inquired as to the amount of condensate in the syphon. Another point that had interested him was the statement that the Harrogate Undertaking only tapped a one-eighth hole. That seemed rather small, and one wondered whether it produced any difficulty, because it was fairly well known that, however careful one might be with long, high-pressure mains, there was always a certain amount of fine dust or similar material left in the main, which cause trouble with so small a tapping. The general argument in favour of rationalization was one with which surely they must all agree. Their objective was to sell more gas, and anything which was likely to help that objective was desirable. Had Mr. Wadsworth found any difficulty in the way of leakage from the long mains owing to vibration of traffic or subsidence? The author had not definitely stated the nature of the mains, but he (Mr. Musgrove) presumed they were wrought-iron tubes.

Mr. J. W. CARLTON (Shipley) asked whether Harrogate had experienced any difficulty in the way of internal corrosion of steel mains, and any difficulties in the matter of unaccounted-for gas due to the use of high-pressure.

Mr. A. WYLIE (Sheffield) said the author had mentioned the matter of employing special people to repair such things as catering apparatus, and one would be interested to know if the Harrogate Undertaking did all its own repairs of that kind. In Sheffield they felt it desirable to send certain classes of repairs back to the makers.

Mr. RALPH HALKETT, Jun. (Sheffield), noted that the author of the paper had made no reference to the distant Pateley Bridge section, which was supplied on a low-pressure main. One would be interested to know the size of that main and whether there was a big consumption off it. In regard to jointing of mains, had the Harrogate Company made use of electric welding on the steel pipes?

The PRESIDENT asked as to the Harrogate Company's system of dealing with repair work in the outlying areas which had been taken over. Did the workpeople, fitters, &c., reside in their old area, and what method of supervision was employed? Another point was that of propaganda for the extension of gas use in further outlying areas. Mr. Wood said he had spent the recent Easter holiday, in company with Mr. Hodsman, also of the Leeds University Fuel Department, in a district somewhat beyond Boroughbridge and of a similar character—a district in which there seemed to be a considerable possibility of gas consumption for household and dairy-farming uses. Mr. Hodsman and himself had taken the opportunity of discussing the possibilities of gas utilization with some of the people of the locality, and to all intents and purposes they seemed never to have heard of the wide possibilities of gas, and were not even interested in the idea of gas for a generous and ready supply of hot water either for the house or the dairy. There seemed to be a likely field for extension of the Harrogate Undertaking in that direction. In going through these rural areas in the laying of a main there seemed to be rich ground for propaganda to bring the advantages of gas to the notice of people who were as yet not familiar with them.

THE AUTHOR'S REPLY.

Mr. WADSWORTH, replying to the discussion, thanked the members for their complimentary remarks on the paper. As far as concerned the matter of local undertaking engineers and the position of their jobs under rationalization, he might say he was himself formerly the Manager at Knaresborough, and he had nothing but the warmest appreciation to express of the manner in which he had been treated by the Harrogate Company on the amalgamation. In answer to Mr. Thorpe's first question, Mr. Wadsworth said pressure gauges on the holders enabled them to know what the pressures were. In regard to the rubber ring joint, that was merely a matter of a convenience to the need of the particular job. In the ordinary way it would have been a welded joint, but it happened to be locally inconvenient. The rubber ring helped in securing tightness. He could not say he was really converted to the advantages of the rubber joint. On the matter of syphons and condensate, the experience on the Harrogate service was that they got practically all the condensate thrown back into the works, and except in one particular district they had very little in the syphons, though he certainly would not say they were unnecessary. In answer to Mr. Holroyd, there was a certain amount of potential storage on the high-pressure mains system which met the difficulty which Mr. Holroyd suggested. As to releasing the valves monthly, if they were not moved regularly they would probably not move at all. In answer to Mr. Musgrove, no trouble was experienced in respect of the smallness of the one-eighth tapping hole on the service. The lack of serious obstruction might be due to some extent to the fact that the wall of the main was very thin. There had been no difficulty in the matter of leakage on the long mains since they applied wrapping. The service tubing was galvanized steel. In answer to Mr. Carlton, Mr. Wadsworth said they had experienced no corrosion difficulty, but he had little doubt they would have difficulty of that sort if they did not give systematic attention to the apparatus. Speaking generally, cases of corrosion were few and far between. The over-all leakage on the Harrogate system was 3·5%. In answer to Mr. Wylie, in most cases the Harrogate Undertaking was able to effect temporary repairs to café and catering appliances, but if the inside was defective the appliance was sent away to the makers. Geysers and articles of that class were regularly repaired by the undertaking; they were fortunate in having a very good man for that class of work, and they were able to keep him fairly well going on it. In reply to the reference by Mr. Halkett, Jun., to the Pateley Bridge service, that was a rather high low-pressure main—about 7 in. on leaving the works—and it had a holder to feed it at Birstwith and two holders at Pateley Bridge. At present they were able to supply without recourse to high pressure. On the question of welding, the welding in all cases had been left to the contractor. The fact that it was acetylene welding was not an indication of any preference one way or the other on the part of the Harrogate Gas Company. On Mr. Wood's question about organization in the outside areas, there was a district superintendent in the area of each works which had been taken over, with at least one resident fitter. Any abnormal or special work was done from Harrogate. As to propaganda among the country people, the Company, naturally, took care to let the people in the districts *en route* know the value of the gas service; and although they were chary of anything that might threaten extra charges, no serious difficulty had been experienced in getting them to take the service.

On the proposition of Mr. F. MURPHY (Barnsley), seconded by Mr. J. W. HOLROYD (Rotherham), a hearty vote of thanks was accorded Mr. Wadsworth for his paper. Thanks were voted to Mr. Halkett and the Directors of the Sheffield Gas Company, for their hospitality during the day, on the motion of Mr. J. E. WAKEFORD (Brighouse), seconded by Mr. B. THORPE (Huddersfield), and the PRESIDENT (Mr. Wood) voiced the thanks of the members of the Council for the privilege of inspecting the Sheffield Gas Company's Research Laboratories.

Mr. HALKETT, responding, said he was proud to be able to say the Sheffield Gas Company had shown its interest in reasonable rationalization by establishing the first gas grid in this country. The thing was quite in its infancy as yet, but by the laying of special trunk mains they had been able to take gas from two further coke oven plants, so that they were now taking gas from five or six coke ovens in all and were shortly extending to another. He hoped this scheme was merely the forerunner of a much wider and more general utilization of coke oven gas through gas undertakings. Sheffield Company was getting new consumers with this gas and was able to sell down to as low as 10d. per 1000 c.ft.

The gathering then adjourned for tea, as guests of the Sheffield Gas Company.

Construction and Erection of a 3 Million Spiral Guided Gasholder in Steel Tank*

By W. T. Hobson, Wolverhampton.

For some years previous to the erection of the new holder, it was anticipated that the storage capacity at Wolverhampton would be increased, as it amounted to only just over 50% of the maximum day's output.

On the recommendation of the Chief Engineer, the Directors decided, early in 1931, to install a new holder with a capacity of 3 million c.ft., giving a maximum pressure of 14 in.—this being sufficient to keep up the pressure on the district at all times without the aid of boosters. Specifications were prepared and several well-known gasholder contractors were invited to send in tenders for guide-framed, spiral-guided, and waterless holders. After making a careful study and comparison of these, my Chief inspected newly erected holders of each type (situated in various parts of the country) before it was decided to install one of the spiral-guided type with steel tank, the tender for this incidentally being the lowest.

The new holder consists of four lifts arranged in steel tank, the sizes being as follows:

Steel tank	. . . .	177 ft. 6 in. dia.	× 35 ft. 9 in. deep
Outer lift	. . . .	175 ,, 0 ,, ,,	× 34 ,, 9 ,, ,,
3rd ,,	. . . .	172 ,, 0 ,, ,,	× 34 ,, 9 ,, ,,
2nd ,,	. . . .	169 ,, 0 ,, ,,	× 34 ,, 9 ,, ,,
Inner ,,	. . . .	166 ,, 0 ,, ,,	× 34 ,, 9 ,, ,,

Foundations.

The foundations consist of a reinforced concrete raft 179 ft. 6 in. in diameter, the outer rim supporting the tank walls and lifts when down, being 1 ft. 2 in. thick strongly reinforced with $\frac{5}{8}$ in. and $\frac{3}{8}$ in. diameter steel bars arranged in eight circles about 1 ft. 6 in. apart, these crossing $\frac{1}{2}$ in. and $\frac{3}{8}$ in. diameter steel radial bars placed at about 1 ft. 6 in. centres. The remainder of the slab, except the portions underneath the centre pier and pipe pits, is 8 in. thick reinforced with $\frac{1}{2}$ in. diameter steel bars spaced each way across the slab forming squares about 1 ft. 3 in. wide. The concrete consists of 4 parts of clean crushed gravel, containing not more than 3% dust and varying in size from $\frac{3}{4}$ in. to $\frac{1}{4}$ in., together with 2 parts of clean sharp sand and 1 part of best Portland cement.

The subsoil below the concrete is composed of good hard clay, capable of safely withstanding a load of 3 to 4 tons per sq. ft.

Steel Tank.

The tank bottom plates are lap jointed and single rivetted throughout. The outer or margin row adjoining the bottom curb is radial, being 6 ft. wide by $\frac{3}{8}$ in. thick, giving additional strength to the bottom curb and providing a clear level surface for the rest blocks.

The intermediate plates are rectangular $\frac{1}{4}$ in. thick, the two plates through which the inlet and outlet pass being $\frac{5}{8}$ in. thick. The bottom plates are attached to the side plates by means of an internal steel angle ring of 6 in. by 6 in. by 1 in. section.

The tank sides consist of seven tiers of plates, as follows:

Bottom tier	. . . . .	1$\frac{1}{8}$ in. thick
2nd ,,	. . . . .	1$\frac{1}{16}$,,
3rd ,,	. . . . .	1 ,,
4th ,,	. . . . .	$\frac{15}{16}$,,
5th ,,	. . . . .	$\frac{13}{16}$,,
6th ,,	. . . . .	$\frac{7}{16}$,,
Top ,,	. . . . .	$\frac{3}{8}$,,

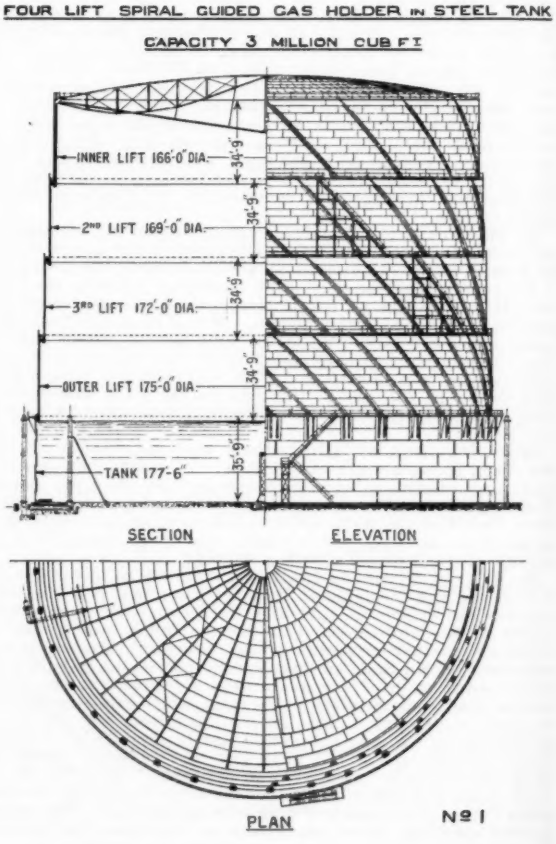
The edges of all the side plates were planed to a bevel for caulking, the circumferential seams being lap jointed and single rivetted. The vertical seams of the five lower tiers are butt jointed with double cover plates, the outer cover plates being double rivetted and the inner cover plates treble rivetted, forming joints of about 80% efficiency, all similar in construction to the one illustrated in fig. 3.

The top two tiers of plates are lap jointed and double rivetted to the $\frac{5}{8}$ in. stiffening plates inserted under each tank carriage. An external angle ring of 5 in. by 5 in. by $\frac{1}{2}$ in. section, termed the top curb, is rivetted to the upper edge of the top tier of side plates.

A balcony 2 ft. wide consisting of $\frac{1}{2}$ in. plain plates with butt joints is fixed around the top of the tank supported by the top curb and 36 pairs of brackets attached to the outside of the $\frac{5}{8}$ in. stiffening plates worked in the tank sides. A continuous ring of tee section is fixed around the outer edge of the balcony, to which are fixed handrail standards about 5 ft. apart supporting 2 rows of 1 in. diameter steel handrail tubing.

A steel lattice centre pier 2 ft. 6 in. square by 22 ft. 2 in. high is secured to the bottom plates in the centre of tank to support the inner lift centre column when the holder is down. Spaced to clear the rivet seams in the bottom plates and the brackets under the cups, 54 R.S. joist rest blocks are placed in the tank bottom to support the lifts when the holder is out of action.

The 30 in. diameter outlet and inlet pipes are fixed diametrically opposite inside the tank, complete with syphon and double-faced valve. They are extended up to the top



of the tank on the outside and then carried down again to below ground level, forming a safety seal. This is purely a precautionary measure to prevent the possibility of the works mains being flooded at any time due to leakage through the pipes inside the tank, as the tank bottom is much higher than the ground level in the main works.

A cast-iron overflow weir is fixed 4 in. below the tank top, the water being carried down to ground level through a 3 in. diameter wrought-iron pipe fixed outside the tank.

In order to give easy access to the tank balcony a steel staircase 2 ft. wide, in two flights, is fixed outside the tank.

The tank balcony previously described is made of $\frac{1}{2}$ in. plain plates throughout, forming a continuous steel ring of girder construction around the tank top, the inside edge being polygonal in shape.

The internal pressure due to the water in the tank exerts a bursting strain on the tank sides which intensifies as the depth increases and stresses the tank side plates in a circumferential direction only. There is no stress longitudinally except the upward and downward thrust from the

* From a paper before the Midland Junior Gas Association, April 6.

carriages and the weight of the side plates, which is comparatively small.

If d = internal diameter in inches.
p = fluid pressure in lbs. per sq. in.
t = thickness of plates in inches.
f = safe tensile strength of plate in lbs. per sq. in.
e = lowest efficiency of rivetted joint.

Strength of Longitudinal Section

$$= pd = 2\,tfe.$$

The greatest load on the circumferential seams may be estimated by considering the maximum load on a carriage as distributed over one bay of plating.

If x = maximum load on carriages in tons.
B = width of one bay in inches.

Strength of Circumferential Section

$$= \frac{x}{Bte}$$

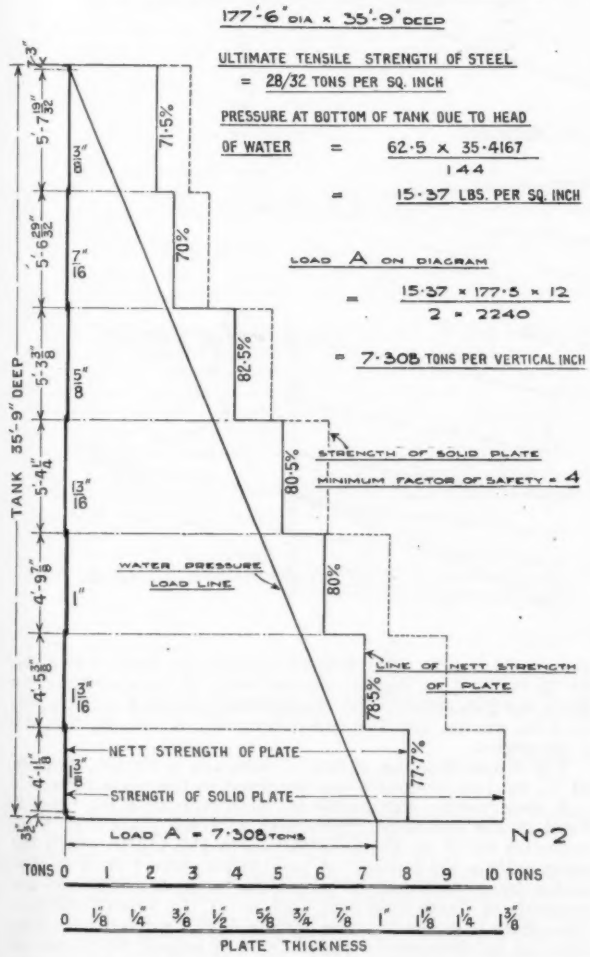
As the circumferential seams are all lap jointed and single rivetted with joints giving an efficiency of about 60%, they need not be further considered.

The plate thickness at any depth of the tank can be ascertained by the formula given for the longitudinal seams.

$$pd = 2tfe, \text{ from which } t = \frac{pd}{2fe}$$

"p" varying according to the head of water.

TANK STRESS DIAGRAM


177'-6" DIA x 35'-9" DEEP
ULTIMATE TENSILE STRENGTH OF STEEL
= 28/32 TONS PER SQ. INCH
PRESSURE AT BOTTOM OF TANK DUE TO HEAD OF WATER = 62·5 x 35·4167 / 144
= 15·37 LBS. PER SQ. INCH
LOAD A ON DIAGRAM
= 15·37 x 177·5 x 12 / 2 x 2240
= 7·308 TONS PER VERTICAL INCH
TANK 35'-9" DEEP
71·5%
70%
82·5%
80·5%
80%
78·5%
77·7%
STRENGTH OF SOLID PLATE
MINIMUM FACTOR OF SAFETY = 4
WATER PRESSURE LOAD LINE
LINE OF NETT STRENGTH OF PLATE
NETT STRENGTH OF PLATE
STRENGTH OF SOLID PLATE
LOAD A = 7·308 TONS
TONS 0 1 2 3 4 5 6 7 8 9 10 TONS
PLATE THICKNESS

Nº2

In the case of the tank in question the pressure at tank bottom is

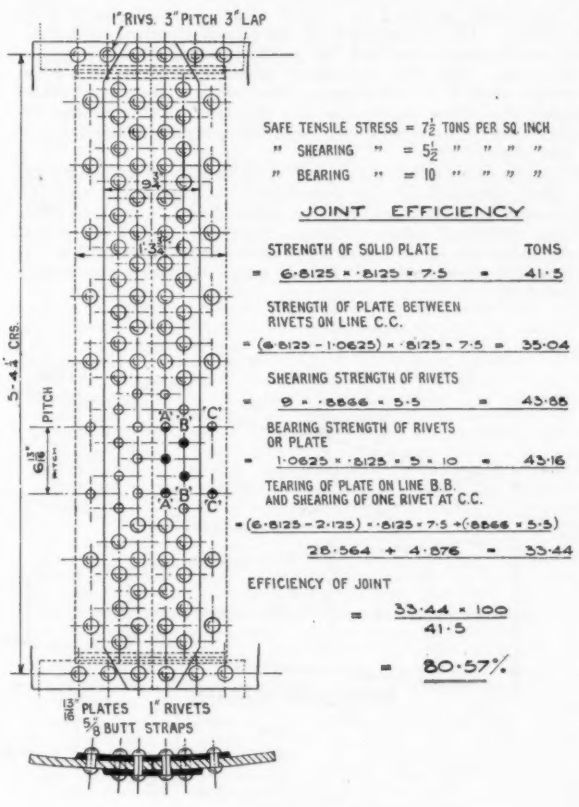
$$\frac{62{\cdot}5 \times 35{\cdot}4167}{144} = 15{\cdot}37 \text{ lbs. per sq. in.}$$

and the thickness of the bottom tier of side plates =

$$t = \frac{15{\cdot}37 \times 177{\cdot}5 \times 12 \times 100}{2 \times 7{\cdot}5 \times 2240 \times 77{\cdot}7} = \frac{1636{\cdot}905}{1305{\cdot}36} =$$

$t = 1{\cdot}254$ in.

The plate thickness of each tier may be calculated separately in the same manner, the depth in each case being taken from the bottom of the tier. These values may also be obtained quickly by plotting a diagram to scale, in which the depth of tank is set down vertically, and the loads, plate strengths, and thickness horizontally. The load per vertical inch of plate due to water pressure is calculated and set down along the base line. A diagonal line representing the water load line is then taken from this point up to the overflow at the top of tank, and from this line the load per vertical inch can be scaled at any point in its depth. Taking the ultimate tensile strength


1" RIVS. 3" PITCH 3" LAP
5'-4½" CRS.
PITCH
SAFE TENSILE STRESS = 7½ TONS PER SQ. INCH
" SHEARING " = 5½ " " " "
" BEARING " = 10 " " " "
JOINT EFFICIENCY
STRENGTH OF SOLID PLATE TONS
= 6·8125 x ·8125 x 7·5 = 41·5
STRENGTH OF PLATE BETWEEN RIVETS ON LINE C.C.
= (6·8125 - 1·0625) x ·8125 x 7·5 = 35·04
SHEARING STRENGTH OF RIVETS
= 8 x ·8866 x 5·5 = 43·88
BEARING STRENGTH OF RIVETS OR PLATE
= 1·0625 x ·8125 x 5 x 10 = 43·16
TEARING OF PLATE ON LINE B.B. AND SHEARING OF ONE RIVET AT C.C.
= (6·8125 - 2·125) x ·8125 x 7·5 + (·8866 x 5·5)
28·564 + 4·876 = 33·44
EFFICIENCY OF JOINT
= 33·44 x 100 / 41·5
= 80·57%
PLATES 1" RIVETS
BUTT STRAPS

TANK SIDE PLATE JOINT
4TH TIER

Nº3

of steel as 30 tons per sq. in., and allowing for a factor of safety of 4, the net strength of plate per vertical inch for any proposed thickness may be calculated and plotted down to the right of the load line. From this the most economical thickness and depth of each tier can be ascertained.

The actual strength of solid plate may also be indicated if desired. This method is shown in fig. 2, which is a stress diagram of the tank as erected.

The following table gives the net strength of plate and the factor of safety for each tier.

	Net Strength of Plate.	Factor of Safety.
Bottom tier—	Tons	
1⅛ in. thick =	$\frac{1{\cdot}375 \times 30 \times 77{\cdot}7}{4 \times 100} = 8{\cdot}01$	$\frac{8{\cdot}01 \times 4}{7{\cdot}308} = 4{\cdot}38$
2nd tier—		
1 1/16 in. thick =	$\frac{1{\cdot}1875 \times 30 \times 78{\cdot}5}{4 \times 100} = 6{\cdot}99$	$\frac{6{\cdot}99 \times 4}{6{\cdot}5} = 4{\cdot}3$
3rd tier—		
1 in. thick =	$\frac{1 \times 30 \times 80}{4 \times 100} = 6{\cdot}0$	$\frac{6 \times 4}{5{\cdot}48} = 4{\cdot}37$
4th tier—		
13/16 in. thick =	$\frac{0{\cdot}8125 \times 30 \times 80{\cdot}5}{4 \times 100} = 4{\cdot}9$	$\frac{4{\cdot}9 \times 4}{4{\cdot}5} = 4{\cdot}35$
5th tier—		
⅝ in. thick =	$\frac{0{\cdot}625 \times 30 \times 82{\cdot}5}{4 \times 100} = 3{\cdot}86$	$\frac{3{\cdot}86 \times 4}{3{\cdot}38} = 4{\cdot}57$
6th tier—		
7/16 in. thick =	$\frac{0{\cdot}4375 \times 30 \times 70}{4 \times 100} = 2{\cdot}3$	$\frac{2{\cdot}3 \times 4}{2{\cdot}3} = 4$
Top tier—		
⅜ in. thick =	$\frac{0{\cdot}375 \times 30 \times 71{\cdot}5}{4 \times 100} = 2{\cdot}0$	$\frac{2 \times 4}{1{\cdot}15} = 6{\cdot}9$

The efficiencies of the treble rivetted butt joints in the five lower tiers are calculated in the manner shown in fig. 3.

GASHOLDER.

The holder is composed of four lifts, the inner lift crown being dome shaped with a rise of 10 ft. 6 in. at the centre. The top and bottom rows of side plates which form one side of the cups or dips, also the rows adjoining the bottom curb, are $\frac{3}{8}$ in. thick, the top hanging row next to the top curb being $\frac{7}{16}$ in. thick, the rows next to the above are all $\frac{1}{4}$ in. thick, and the remaining side sheeting 10 B.G. thick. The outer row of crown plates is $\frac{1}{2}$ in. thick and the next row $\frac{5}{16}$ in. both being butt jointed. The adjoining row and the row next to the $\frac{1}{4}$ in. centre sheet is $\frac{5}{16}$ in. thick with lap joints. The remainder of the crown sheeting is 8 B.G. thick with single rivetted lap joints throughout.

The cups and dips are constructed of 11 in. by $3\frac{1}{2}$ in. channels and $\frac{3}{8}$ in. skirting plates with a flat bead fixed around the open edge, the dip skirting plates being extended 3 in. above each dip channel giving additional seal to the cups.

The cup channels are supported by means of pressed steel brackets attached to the extended vertical stays, and the dip channels with angle knee brackets fixed to the top sides of the vertical stays. These brackets give additional strength to the channels and prevent them being pulled out of level by the weight of the hanging lifts when the holder is inflated.

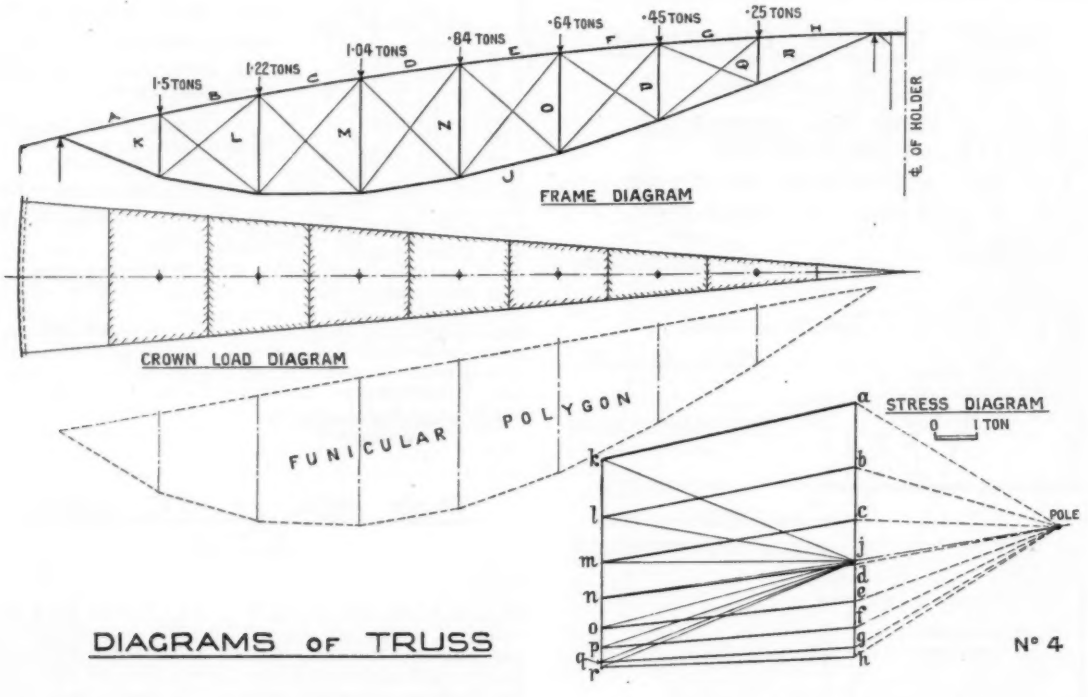
induced by the various panel loads. From the loading diagram shown, together with the frame and stress diagrams in fig. 2 it will be seen that the area of crown supported by each main rafter is triangular in shape and that the load on each strut differs, the greatest load coming on the strut nearest the curb and gradually diminishing towards the centre of the crown.

The bottom boom of the truss, which follows the lines of its funicular polygon, bears a relationship to the bending moment diagram, the stresses in the various members being consequently reduced to the least possible value.

It will be seen from the stress diagram that the diagonal panel bracing is not called upon to take any load under normal conditions. It is included chiefly for erection purposes, and apart from taking any small extraneous loads likely to come on the crown it also gives additional stiffness to the structure.

The main tension rod is formed of two steel flats spaced apart, so as to embrace the truss at the point of maximum load keeping it in a vertical position even when it is subjected to unequal loading.

The rafters are secured to the vertical stays with steel brackets and are firmly bolted to the crown plate at the other end. Thirty-six main tension bars, each consisting of two $3\frac{1}{2}$ in. by $\frac{1}{2}$ in. flats, extend from the brackets on the top curb to the truss plate at the bottom of the centre column. The bracket bars, which are fixed about 5 ft. apart between the rafters, are slightly curved to suit the



DIAGRAMS OF TRUSS

N° 4

Thirty-six vertical stays are fixed at equal distances apart on the inside of each lift, being bolted at the top and bottom rows of side plates and to the spiral plates where they intersect same.

They are formed by 8 in. by 3 in. channels in the three lower lifts and of 12 in. by 6 in. by 54 lbs. R.S. joists in the inner lift. The $13\frac{1}{2}$ in. by $\frac{5}{16}$ in. spiral plates are rivetted in the side sheeting of each lift, to provide a strong level surface for the attachment of the spiral rails. The bottom curb is formed of an external channel ring of 11 in. by $3\frac{1}{2}$ in. section fixed around the bottom of the outer lift. The top angle curb which forms the connection between the crown and side sheets, also the inner curb, which is fixed under the crown and attached to the inside of the vertical stays, are of 6 in. by 6 in. by $\frac{3}{4}$ in. section. The crown framing consists of 36 Milbourne patent trussed rafters. The upper boom consists of a 5 in. by 5 in. by $\frac{1}{2}$ in. tee curved to the proper radius, and the lower boom of 5 in. by $\frac{5}{16}$ in. flat. Spaced at equal distances along the truss are seven vertical struts each being formed of two $2\frac{1}{2}$ in. by $2\frac{1}{2}$ in. by $\frac{3}{8}$ in. angles bolted to the upper and lower booms.

Each panel formed by the struts is braced diagonally with $2\frac{1}{2}$ in. by $\frac{1}{4}$ in. steel flats. This type of truss differs from the usual French or ordinary type, inasmuch that the struts are vertical instead of radial, and that the lengths vary according to the depth of the bending moment

rise of the crown. The four inner rows are formed of $2\frac{1}{2}$ in. by $2\frac{1}{2}$ in. by $\frac{1}{4}$ in. angles, the 5th and 6th rows of $3\frac{1}{2}$ in. by $2\frac{1}{2}$ in. by $\frac{1}{4}$ in. angles, the 7th and 8th rows of 4 in. by $2\frac{1}{2}$ in. by $\frac{1}{4}$ in. angles, and the two outer rows of 5 in. by 3 in. by $\frac{5}{8}$ in. angles.

The crown framing is braced laterally with four bays of $2\frac{1}{2}$ in. by $\frac{1}{4}$ in. diagonal bracing fixed to the main rafters.

A steel centre column 30 in. diameter by $\frac{3}{8}$ in. thick is fixed in the centre of crown with a crown plate 7 ft. 6 in. diameter by $\frac{1}{16}$ in. thick welded on at the top to which the main rafters are bolted. A steel truss plate 7 ft. 6 in. diameter by $\frac{1}{2}$ in. thick, to which the main tension bars are secured, is fixed near the bottom of the centre column. This plate is secured to the bottom of the column with long bolts $1\frac{1}{8}$ in. diameter screwed the full length, by means of which the main tension bars are adjusted. A double row of 1 in. diameter handrail tubing is fixed around each dip and the outer edge of crown, supported in $2\frac{1}{2}$ in. by $2\frac{1}{2}$ in. by $\frac{3}{8}$ in. angle standards spaced about 7 ft. apart.

A spiral ladder of staircase form is fixed on each dip and tank balcony to give access to the dips and crown of the holder. They are curved to the required radius and are formed of angle stringers with steel chequered plate treads, each flight being protected with two rows of handrailing supported in round steel standards fixed to the outside stringer.

When the holder is inflated the ladders are supported by

the rails engaging with the rollers fixed to the next inside lift.

Spiral guide rails are fixed to the outside of each lift, 18 on the inner and second lifts, 27 on the third, and 36 on the outer lift. These rails are strongly bolted to the ⅛ in. spiral plates incorporated in the side sheeting at an angle of 45°. The roller carriages which are fixed on the dips and tank balcony, to engage with the above rails, are constructed of steel throughout. They permit free expansion and contraction of the holder and are provided with dust-proof bearings and oil bath lubrication.

The diameters of the carriage axles vary in accordance with the load and are designed to withstand safely the following vertical loads:

Tank carriages	safe load	=	10	tons
0. lift	,,	,,	=	8·5 ,,
3rd lift	,,	,,	=	5·2 ,,
2nd lift	,,	,,	=	3 ,,

These are greatly in excess of the actual loads coming upon them.

The maximum vertical and horizontal loads may be calculated from the formula deduced by S. M. Milbourne in the "GAS JOURNAL" for Feb. 10, 1932, in which the wind and snow loads are taken separately:

$$x = \frac{1{\cdot}14\ H^2 p + 0{\cdot}848 s}{n}$$

where x = maximum load on carriages.
n = number of guides on floating lift.
p = normal wind pressure per sq. ft. in lbs.
S = the maximum allowable snow load on one half of the crown in lbs.
H = the height of holder above tank balcony in feet.

$$\therefore x = \frac{1{\cdot}14 \times 131{\cdot}5 \times 131{\cdot}5 \times 32 + 0{\cdot}848 \times 57080}{36}$$

$$x = \frac{630821 + 48404}{36}$$

$$x = 18867 \text{ lbs.} = 8{\cdot}42 \text{ tons.}$$

It will be noticed that the wind pressure is taken at 32 lbs. per sq. ft., which is quite sufficient for an inland station such as Wolverhampton when the snow load is also considered.

An anti-freezing device consisting of 16 steam injectors (four around top of tank and four in each cup) is fixed to the holder to prevent the water freezing during winter time.

The materials used in the construction of the holder are of British manufacture throughout, the steel used being manufactured by the Siemens-Martin process capable of sustaining a tensile strain of 28-32 tons per sq. in. with an elongation of not less than 20% in 8 in. All plates and sheets were gauged at three places along each edge, and any individual sheet which was 2½% under thickness at any point was rejected. The rivet holes in all plates were drilled, and those in the sheets were punched in a multiple punching machine taking the whole side of sheet in one operation.

The whole of the materials received one coat of pure red lead paint at the contractor's works, one coat of same quality in all joints during erection and a further coat of red lead paint over exterior after erection.

A final coat of best quality Torbay paint was afterwards applied.

Discussion.

The PRESIDENT (Mr. F. A. C. Pykett) said the paper was most informative and lucid.

Mr. W. MACNAUGHTON (Wolverhampton), in proposing a vote of thanks to Mr. Hobson, said he was to be congratulated on the able way in which he had treated a difficult subject. Although he had not said anything about the actual working of the holder, they at Wolverhampton were satisfied that it was a first-class job; it had worked at 100% efficiency through the severe winter weather.

Mr. J. H. WAINWRIGHT (Halesowen), seconding the vote of thanks, said the paper had enabled them to visualize the gradual building up of the holder by easy stages.

Mr. R. J. MILBOURNE (C. & W. Walker, Ltd.) said Mr. Hobson had had exceptional opportunities, prior to going to Wolverhampton, of acquiring knowledge regarding gasholder construction. It was interesting to know that the storage capacity at Wolverhampton had got down to 50% of the maximum day's output. The usual capacity required was supposed to be equal to the day's make, but that had long gone by the board owing to the fact that gas was no longer required exclusively for lighting. It was also interesting to hear that the cost of the gasholder compared favourably with those of the other types; that was probably due to its size. He was sure it would be impossible for a waterless holder to compete with the spiral type for anything under 3 million c.ft. capacity. The one important point which was entirely a new departure was a polygonal form of curb, and it was of the utmost importance that the type of curb of the tank should be sufficiently strong to resist stresses and strain. That point needed the most careful attention, particularly in holders of over a million c.ft. capacity. Such an arrangement seemed to have been made for the first time in England, and he had no doubt it would be extensively adopted. Discussing features of the holder, Mr. Milbourne said he regarded the main tension rod as a most important feature, because it prevented any twisting movement of the truss. He had often found that a truss would twist during its working out of the vertical line, but it appeared that the present arrangement kept the truss in its proper place. It was important that a gasholder must be flexible in order to work smoothly, but that flexibility should not be taken advantage of, in allowing defective work to pass, and no great variation in the diameter should be allowed. As to the gauging of sheets, he said it was most important that the gas engineer should see that when he specified ten-gauge sheets he got a ten-gauge which would be equal to ten gauge in practice.

Mr. T. H. POULSON (Stafford) said that Mr. Hobson's knowledge of gasholder construction was considerable, and he had no doubt that his contribution would be looked upon as a work of reference. He had noticed that, in common with many other holders, in the joints of the sheeting red lead was used, and he would like to know if there had been any instances of the red lead attacking the jointings. In his own experience that had happened on one holder, and the effect was to leave a sort of naphthalene deposit on the side of the sheets close to where the escape occurred. In these circumstances it occurred to him whether another material would be better to use than red lead. The way the Wolverhampton holder had been constructed, and the fact that there had been no accidents, was a tribute to the contractors and to the men engaged.

Mr. HOBSON, in reply, said that so far there had been no difficulty or defects arising in consequence of the use of red lead in the jointing. If the sheets were put in with care, and the red lead properly applied, it did not appear to him that leakage was likely to occur.

Wales and Monmouthshire Junior Gas Association

ANNUAL MEETING

The Annual Meeting of the Association was held at Newport on Saturday, April 22, when Mr. C. S. THANE, of Newport, President, was in the chair.

On behalf of the Directors of the Newport (Mon.) Gas Company, the Association were welcomed to Newport by Mr. J. H. CANNING, Engineer and Manager. Referring to the Annual Report of the Council, Mr. Canning was glad to see that mention was again made of the help received from the Wales and Monmouthshire Association of Gas Engineers and Managers, and that they appreciated the assistance of the Secretary, Mr. Octavius Thomas, who, probably more than anyone else in Wales and Monmouthshire, was deserving of their goodwill. Mr. Canning then congratulated the Association upon the interesting visits which had been arranged, and the authors upon the high standard which had been attained in the series of papers given at their meetings. He would like, he said, to pay tribute to the excellent work which was being done at Cardiff, where the Regional Industrial Centre had been established, and to those Officials of the Cardiff Gas Company who were engaged upon the important research work which was one of the main objects of the centre—viz., Mr. H. D. Madden, the Engineer and Manager, Mr. B. J. Bell, and Mr. A. J. Cruise.

The Annual Report of the Council was presented by the PRESIDENT.

In the Report the Council acknowledge the help received during the past twelve months from the Institution of Gas Engineers and their Secretary, Mr. J. R. W. Alexander; from the Society of British Gas Industries who this year are offering Silver Medals for the best paper given to each of the Junior Associations throughout the country; and from the authors of the papers.

The Association, continues the Report, is again indebted to Mr. J. H. Canning for a further gift to the Library during the present year. There are now about a hundred volumes in the Library.

In the 1932 Examinations of the Institution of Gas En-

gineers no fewer than ten members of the Association were successful in the various grades.

The Council place on record their gratitude to two members of the Council who have rendered outstanding service over a long period of years. In the first case, Mr. B. J. Bell, of Cardiff, has been successively Secretary, President, and Treasurer, the last-named being the office which he now holds; and he has again accepted nomination. In the other case, Mr. W. E. Crowley, of Newport, having fulfilled his term as a Past-President retires automatically. He has served on the Council, in one capacity or another, since the foundation of the Association.

Alterations in Rules.

Among alterations to the rules of the Association are the following:

Rule 4 to read:

"*Qualification for membership.*—Members, hon. members, and student members shall consist of persons engaged in or associated with the manufacture or distribution of gas, being employed in any gas undertaking, other than the manufacture of gas appliances, articled, or other, pupils, in training for the gas profession. All applicants under the age of 21 years shall, their qualifications being approved by the Council, be accepted as student members. Hon. members may be elected by the Council, upon confirmation by a General Meeting of members, from persons associated with the Gas Industry. Associates shall be persons over 21 years of age who have sufficient professional knowledge or experience, and who are considered by the Council qualified to assist in promoting the objects of the Association."

Rule 6. The first part of the rule to read:

"The subscription for members and associates shall be 10s. per annum, payable in advance on election, and on each successive Sept. 1. Fees for student members shall be 5s. per annum payable as before mentioned," &c.

Rule 9. "Associate members" to read "Student members."

Election of Officers.

The following Officers were elected for the year 1933-34:

President.—Mr. H. S. Bartlett, Cardiff.

Senior Vice-President.—Mr. A. D. Howells, Neath.

Junior Vice-President.—Mr. J. F. Rust, M.Inst.Gas E., Newport.

Hon. Treasurer.—Mr. B. J. Bell, M.Inst.Gas E., Cardiff.

Hon. Librarian.—Mr. K. Langford, Cardiff.

Hon. Auditors.—Messrs. A. W. Stickler and T. Noall, Cardiff.

Hon. Secretary.—Mr. R. S. Snelling, F.C.I.S., Newport.

Vacancies on Council were filled by the election of Mr. C. B. Felton and Mr. J. H. Canning, Jun., of Newport.

Mr. B. J. Bell and Mr. W. E. Crowley acknowledged the references made in the Council's Report and said that at no period had their interest in the work of the Association been keener.

Appreciative references to the proposal of the Society of British Gas Industries to award Silver Medals for the best paper presented at the meetings of each Association; discussion on a summer meeting and visit; votes of thanks to the Directors of the Newport (Mon.) Gas Company, for their hospitality; and to the Hon. Secretary, concluded the proceedings.

Legal Intelligence.

Infringement of Trade Mark Action.

A pending action by the South Metropolitan Gas Company, Ltd., against the Metropolitan Gas Meters, Ltd., to restrain alleged infringement of trade mark was mentioned to Mr. Justice Maugham in the Chancery Division on Thursday, April 27.

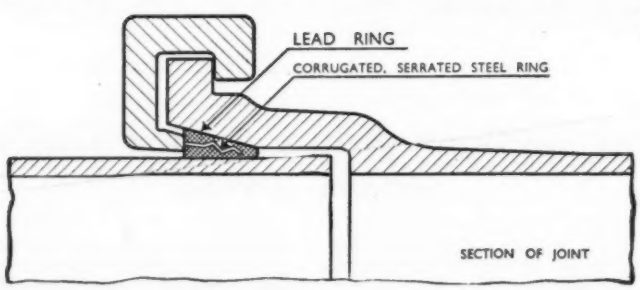
Mr. Drewe, for the defendants, stated that they were applying to the Registrar of Trade Marks to register the same mark as the plaintiffs' under section 21 of the Act, on the ground of *bona fide* general user. The Court of Appeal recently made an order in similar circumstances that on the defendants undertaking to prosecute their application with due diligence all further proceedings in the action should be stayed pending the hearing of the proceedings before the Registrar. He asked that the action be stayed pending the Registrar's decision.

Mr. R. E. Burrell, for the plaintiffs, consented, and his Lordship made the order asked for.

Mr. Drewe also stated that the defendants had a motion to expunge the plaintiffs' mark from the register.

The STANTON Mechanical Lead Joint

(Patent applied for)



NO INCREASED COST

This mechanically made joint works on a similar principle to the Stanton-Wilson Joint, but employs a lead ring in which is encased a thin corrugated, serrated steel ring. It is more flexible than a caulked joint and provides for expansion and contraction of mains—No skilled labour needed.

N.B.—Where a considerable degree of flexibility is required, use the Stanton-Wilson self-adjusting Joint, which has been adopted by over 200 Public Undertakings in this country.

The Stanton Ironworks Company Limited, Near Nottingham

Parliamentary Intelligence.

[From Our Special Correspondents.]

House of Lords.

Special Orders.

The Special Order proposed to be made on the application of the Swansea Gas Light Company was laid before the House on April 26 for affirmative resolution and referred to the Special Orders Committee.

House of Commons.

Private Bills.

The South Suburban Gas Bill was heard by the Examiners on April 25, who have reported that the Standing Orders not previously inquired into have been complied with.

The Gas Light and Coke Company Bill, as amended, has been ordered to lie upon the Table for consideration.

The Commercial Gas Bill is to be considered by the Unopposed Bills Committee to-day. The members of the Committee are as follows: The Chairman of Ways and Means, the Deputy-Chairman, Mr. Charles Brown, Mr. Hanbury, and Mr. Cook.

Special Orders.

Plans have been deposited for a Special Order under the Gas Undertakings Acts, 1920 to 1932, entitled the Bristol Gas Order.

Gas Companies' Results in 1932.

Haywards Heath.

Another year of prosperity was recorded at the Annual Meeting of the Haywards Heath District Gas Company, when Mr. E. C. Charleton, Chairman of Directors, presided. The Chairman, in moving the adoption of the report, statement of accounts and balance-sheet, said: The only difference in the capital account is the alteration of the redeemable preference stock, which was issued at 6½% in 1922—£20,000 in all—which has now been replaced by irredeemable preference stock bearing interest at the rate of 5½%. The generous terms upon which this substituted capital was issued met, of course, with a ready response, and are much appreciated by the holders. The loan capital remains as before. The increase in the sales of gas shows 2·43% for the year as compared with 1931. The sales of gas on the credit side show an increase of approximately £600. Rental of meters and fittings are much the same as last year, and the residual products are slightly increased, a fact which should be recognized by the stockholders with satisfaction, as in many companies there has been a decrease in this particular item. The resources of the Company have been further strengthened by an addition of £1500 to the repairs suspense account. It must be recognized that in a growing district such as Haywards Heath our works and mains must be kept absolutely up to date and opportunities for improvement will always be present to those who watch the interests of the Company closely. In addition to the principal plant erections referred to in the Directors' report, other works reconstructions are in course of progress. The ultimate result is that we carry a balance forward to the profit and loss account of £4574, which enables us once again to pay a dividend on the ordinary stock of 9%, less income-tax, for the year 1932. As is indicated in the Directors' report, considerable repairs and replacements of plant will have to be carried out during the forthcoming year, and the provision of nearly £8000 in the repairs suspense account is a comforting item. It will be necessary to provide a larger works weighbridge, storage tanks, and purifiers, together with new trunk mains in certain districts. The final dividend which we shall now be paying is at the rate of 10% for the half-year to Dec. 31, 1932, an interim dividend having been declared in September last at the rate of 8%, and the balance to be carried forward amounts to £4466.

Metropolitan Gas Companies' Testings.

The Gas Referees' report on the official testings for the past quarter gives the following average calorific values for the gas supplied by the Metropolitan Companies named.

Commercial Gas Company.—501·7 B.Th.U. (declared calorific value, 500 B.Th.U.).

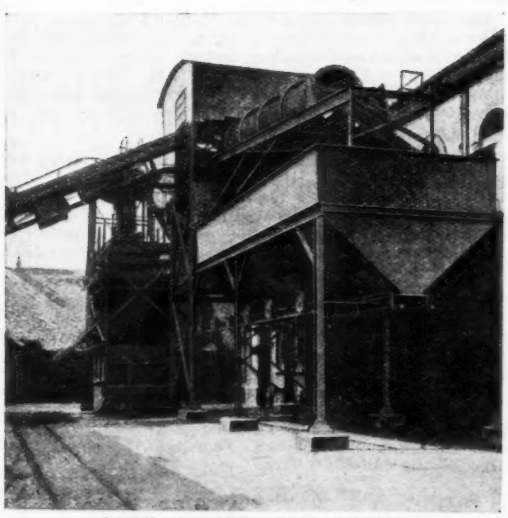
Gas Light and Coke Company.—503·2 B.Th.U. (declared calorific value, 500 B.Th.U.).

South Metropolitan Gas Company.—562·1 B.Th.U. (declared calorific value, 560 B.Th.U.).

South Suburban Gas Company.—561 B.Th.U. (declared calorific value, 560 B.Th.U.).

Tottenham and District Gas Company.—501·3 B.Th.U. (declared calorific value, 500 B.Th.U.).

Wandsworth and District Gas Company.—502 B.Th.U. (declared calorific value, 500 B.Th.U.).

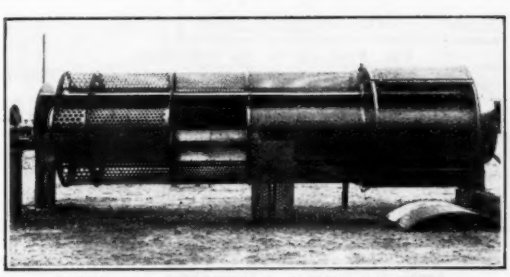


COKE SCREEN AND BUNKER.

COAL & COKE HANDLING PLANT OF ALL TYPES.

SELLING AGENTS FOR

POOL'S ROTARY COKE SCREENS.



POOL "SUPERFEX" COKE SCREEN.

SAML. CUTLER & SONS, LTD.

39 VICTORIA STREET, WESTMINSTER.

LONDON

PROVIDENCE IRON WORKS, MILLWALL.

VICTORIA 0321 and 8492
RETORTUS, SOWEST, LONDON

TELEPHONES:
TELEGRAMS:

EAST 1734 and 1735
CUTLER, MILLWALL, LONDON

408

GAS MARKETS & MANUFACTURES

Stock Market Report.

[For Stock and Share List, see later page.]

Budget day has come and gone and we now know the best or the worst for another year. Gilt-edged and other high-class investment securities soon recovered from the inertia usually prevalent at Budget time, and the prices of many showed improvement on the week. A fillip was also given to other sections by the various trade agreements made during the week, particularly coal shares, while the good industrial reports lately issued may assist in converting some of the pessimists.

The Gas Market was exceptionally active, and a large number of transactions were recorded. After the comparative quiet of the previous week, prices commenced to improve again and some notable increases occurred. Cardiff consolidated headed the list with a gain of 11 points to 121½, business being done at 121; Imperial Continental, on the good results disclosed by the accounts issued during the week, rose 10 points to 217; while Tottenham 5½% preference at 125½ showed a gain of 5 points, and Barnet ordinary rose 4 points to 159½. The Tottenham Company's 5% preference stock appears in the Stock Exchange Official List for the first time this week, and has, therefore, been included in the "JOURNAL" List, the quotation being 110-115.

For those requiring high-class permanent investments, with a return a little above that obtainable on gilt-edged securities, attention is drawn to Gas Light 3½% maximum stock, which at round about the present price of 86½ gives a yield of 4%. Some of the stocks of sound Provincial undertakings appear to be somewhat undervalued and also merit attention. Among these are the Mid-Southern District Utility 5% maximum at 105½, though business was recorded last week at 108, and, on the Bristol Exchange, Newport (Mon.) 5% maximum, which is quoted at par.

Current Sales of Gas Products.

The London Market for Tar Products.

LONDON, *May* 1.

The position in the tar products market is as follows:

Pitch remains quiet, and the price is called about 90s. per ton f.o.b., according to period of shipment.

Creosote is about 2¼d. per gallon f.o.b.

Refined tar is about 4d. to 4¼d. per gallon in bulk at makers' works.

Pure toluole is about 2s. 4d.; pure benzole, about 1s. 11d.; solvent naphtha, 95/160, about 1s. 7d. to 1s. 8d.; and 90/140 pyridine bases, 3s. 6d. to 3s. 9d. per gallon naked at makers' works.

Tar Products in the Provinces.

May 1.

The average prices of gas-works products during the week were: Gas-works tar, 32s. 6d. to 37s. 6d. Pitch—East Coast, 82s. 6d. to 85s. f.o.b. West Coast—Manchester, Liverpool, Clyde, 82s. 6d. to 85s. f.o.b.* Toluole, naked, North, 1s. 9d. to 2s. Coal-tar crude naphtha, in bulk, North, 6d. to 6¼d. Solvent naphtha, naked, North, 1s. 5½d. to 1s. 6d. Heavy naphtha, North, 10d. to 11d. Creosote, *ex* works, in bulk, North, liquid and salty, 2d. to 2½d.; low gravity, 1¾d. Scotland, 2d. to 2½d. Heavy oils, in bulk, North, 4d. to 4½d. Carbolic acid, 60's, 2s. 9d. to 2s. 10d. Naphthalene, £9 to £10. Salts, 55s. to 75s., bags included. Anthracene, "A" quality, 2½d. per minimum 40%, purely nominal; "B" quality, unsalable.

* All prices for pitch are now quoted on the basis of f.o b. In order to arrive at the f.a.s. value at any port it will be necessary to deduct the loading costs and the tolls whatever they may be.

Tar Products in Scotland.

GLASGOW, *April* 29.

Considerable quantities of various products have changed hands during the week, and, although prices show little or no alteration, there is a better feeling prevalent.

Crude gas-works tar.—The actual value is 42s. 6d. to 47s. 6d. per ton *ex* works.

Pitch.—Export business is now practically finished, and the value is nominal at 77s. 6d. to 80s. per ton f.o.b. Glasgow. In the home trade price is round 80s. to 82s. 6d. per ton *ex* works in bulk.

Refined tar to Ministry of Transport Specification is now selling freely at 3½d. to 3¾d. per gallon *ex* works naked, according to quantity.

Creosote oil.—Quotations are unchanged. B.E.S.A. Specification is 2¼d. to 2¾d. per gallon; low gravity, 2d. to 2½d. per gallon; and neutral oil, 2½d. to 2¾d. per gallon; all in buyers' rail tanks ex works.

Cresylic acid.— Business is again quieter, but prices are unchanged. Pale, 97/99%, is 10d. to 11d. per gallon; dark, 97/99%, 9d. to 10d. per gallon; and pale, 99/100%, 1s. 1d. to 1s. 2d. per gallon—all f.o.r. in buyers' packages.

Crude naphtha is scarce with value steady at 4½d. to 5d. per gallon, according to quantity and quality.

Solvent naphtha.—90/160 grade is 1s. 3d. to 1s. 4d. per gallon, and 90/190 grade 11d. to 1s. per gallon *ex* works.

Motor benzole.—Price is firm at 1s. 4d. to 1s. 5d. per gallon in bulk *ex* works.

Pyridines.—90/160 grade is 3s. to 3s. 3d. per gallon, and 90/140 grade 3s. 3d. to 3s. 6d. per gallon.

Benzole Prices.

These are considered to be the market prices for benzole at the present time.

	s. d.		s. d.	
Crude benzole	0 10½	to	0 11	per gallon at works
Motor ,, ...	1 6½	,,	1 7	,, ,, ,,
Pure ,, ...	1 10	,,	1 11	,, ,, ,,

Trade Notes.

Patent Retorts, Ltd.

The New Consolidated Gold Fields, Ltd., have decided to duplicate their shale retorting plant in Esthonia by installing a further battery of Davidson rotary retorts (Patent Retorts, Ltd., 5, Victoria Street, London, S.W. 1). The present battery has been in constant operation for two years and has given great satisfaction.

Kirkham, Hulett, & Chandler.

The Lewes Gas Company have recently placed an order with Messrs. Kirkham, Hulett, & Chandler, Ltd., of Norfolk House, Norfolk Street, London, W.C. 2, for one of their 3 ft. 6 in. patent spiral centrifugal washers of 1 million c.ft. per day capacity for the extraction of ammonia. These machines are particularly noteworthy for the elimination of final traces of tar fog present in the gas.

United Engineers and Founders, Ltd.

This Company has opened a London Office at 9, Victoria Street, Westminster, S.W. 1, and represents the interests of four prominent engineering firms of South Wales. Among other activities, these firms make and machine steel castings up to 25 tons, iron castings up to 40 tons, bronze castings up to 4 tons, and carry out mild-steel welded tank and constructional work. Mr. Denis Thomas, a Director of one of the associated Companies—Messrs. Thomas & Clement, Ltd.—is in charge of the London Office.

Contracts Advertised To-Day.

Coal.

Bingley Gas Department. [p. 294.]

Dewsbury Corporation Gas Department. [p. 294.]

Padiham Urban District Council Gas Department. [p. 293.]

Condenser.

Plymouth Gas Department. [p. 294.]

Mantles.

Birmingham Corporation. [p. 294.]

Meters.

Stockton-on-Tees Corporation Gas Department. [p. 293.]

Stores.

Birmingham Corporation. [p. 294.]

Stockton-on-Tees Corporation Gas Department. [p. 293.]

STOCK AND SHARE LIST.

Official Quotations on the London and Provincial Stock Exchanges.

Issue. £	Share.	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations. April 29. (Provincial Exchanges April 28.)	Rise or Fall on Week.	Transactions. Lowest and Highest Prices During the Week.
1,551,868	Stk.	Apl. 3	7⅞	7	Alliance & Dublin Ord. ...	122—132	+2	127½
374,000	„	Jan. 9	4	4	Do. 4 p.c. Deb. ...	85—95	...	...
557,655	„	Mar. 6	7	7	Barnet Ord. 7 p.c.	157—162	+4	160—160½
300,000	1	Oct. 17	1/9⅓	1/4⅓	Bombay, Ltd.	24/6—26/6	...	25/3—26/-
178,280	Stk.	Feb. 20	9½	9½	Bournemouth sliding scale	195—205	...	200—202
550,050	„	„	7	7	Do. 7 p.c. max. ...	157—162	...	158½—162
439,160	„	„	6	6	Do. 6 p.c. Pref. ...	137—142	...	140
50,000	„	Dec. 19	3	3	Do. 3 p.c. Deb. ...	75—80	...	...
162,025	„	„	4	4	Do. 4 p.c. Deb. ...	101—106	...	...
210,000	„	„	5	5	Do. 5 p.c. Deb. ...	122—127	...	...
357,900	„	Mar. 6	7½	7½	Brighton, &c. 6 p.c. Con. ...	152—157	...	...
540,000	„	„	6⅔	6⅔	Do. 5 p.c. Con. ...	141—146	...	145½
195,500	„	„	6	6	Do. 6 p.c. B Pref.	133—143	...	...
1,487,500	„	Mar. 6	5	5	Bristol 5 p.c. max.	111—113*a*	...	...
120,420	„	Dec. 19	4	4	Do. 1st 4 p.c. Deb. ...	100½—101½*a*	...	...
217,870	„	„	4	4	Do. 2nd 4 p.c. Deb. ...	100½—101½*a*	...	...
328,790	„	„	5	5	Do. 5 p.c. Deb.	120—124*a*	...	...
855,000	„	Apl. 3	7	8	British Ord.	147—152*	...	149½—150
100,000	„	Dec. 19	7	7	Do. 7 p.c. Pref.	147—152	...	...
350,000	„	„	—	5½	Do. 5½ p.c. Pref. ...	105—110	...	...
120,000	„	„	4	4	Do. 4 p.c. Red. Deb. ...	95—100	...	98
450,000	„	„	5	5	Do. 5 p.c. Red. Deb. ...	105—115	...	107
160,000	„	Jan. 9	5	5	Cambridge 5 p.c. Deb. ...	117—122	...	...
100,000	10	Dec. 5	6	6	Cape Town, Ltd.	7½—8½	...	8½
100,000	10	Apl. 24	4½	4½	Do. 4½ p.c. Pref. ...	6—7*	...	£6 18/0
150,000	Stk.	Dec. 19	4½	4½	Do. 4½ p.c. Deb. ...	88—93	...	...
626,860	„	Feb. 20	6	6	Cardiff Con. Ord.	119—124	+11	191
237,860	„	Jan. 9	5	5	Do. 5 p.c. Red. Deb.	105—110	...	...
157,150	„	Feb. 20	5	6½	Chester 5 p.c. Ord.	97—103*b*	...	...
98,936	1	Oct. 17	2/-	2/-	Colombo, Ltd. Ord.... ...	25/—30/-	...	...
24,500	1	Oct. 17	1/4⅓	1/4⅓	Do. 7 p.c. Pref. ...	19/- - 21/-	...	...
609,204	1	Mar. 20	/11'48	/11'48	Colonial Gas Assn. Ltd. Ord.	16/—18/-	...	...
296,053	1	„	1/3'30	1/3'30	Do. 8 p.c. Pref.	19/—21/-	...	...
1,796,955	Stk.	Feb. 20	5	6½	Commercial Ord.	112—117	...	115
475,000	„	Dec. 19	3	3	Do. 3 p.c. Deb. ...	75—80	...	77
265,272	„	Mar. 6	—	5	Do. 5 p.c. Deb. ...	120—125	...	124
807,560	„	Feb. 20	7	7	Croydon sliding scale ...	145—150	...	147½—149
463,590	„	„	5	5	Do: max. div.	101—106	...	101½—103
500,000	„	Jan. 9	5	5	Do. 5 p.c. Deb.	120—125	...	122½
544,270	„	Mar. 6	7	10	Derby Con.	150—160*c*	...	...
55,000	„	Jan. 9	4	4	Do. 4 p.c. Deb.	80—85*c*	...	...
289,000	„	Mar. 6	5	5	East Hull Ord. 5 p.c. ...	101—106	+1	105—105½
179,500	„	Mar. 6	6	6	East Surrey Ord. 5 p.c. ...	120—125	...	...
155,019	„	Dec. 19	5	5	Do. 5 p.c. Deb. ...	117—122	...	...
1,092,180	„	Apl. 3	†5	†7	European, Ltd.	132—137	−1	132—137
19,373,932	„	Feb. 20	5⅝	5⅝	Gas Light & Coke 4 p.c. Ord.	25/—26/-*f*	...	25/3—25/9
2,600,000	„	„	3½	3½	Do. 3½ p.c. max.	85—89	...	87—88½
4,477,106	„	„	4	4	Do. 4 p.c. Con. Pref. ...	102—105	...	101½—103½
6,102,497	„	Dec. 19	3	3	Do. 3 p.c. Con. Deb. ...	79½—82	−½	80½—82
3,642,770	„	„	5	5	Do. 5 p.c. Red. Deb. ...	115—118	...	116½—117½
3,500,000	„	„	4½	4½	Do. 4½ p.c. Red. Deb. ...	111—114	...	113—114
270,466	„	Mar. 6	6	6	Harrogate New Cons. ...	113—118	...	...
82,500	„	Mar. 6	7	7	Hastings & St. L. 5 p.c. Conv.	138—143	...	...
258,740	„	„	5½	5½	Do. 5½ p.c. Conv.	110—115	...	112½
70,000	10	Apl. 24	†10	†10	Hongkong & China, Ltd. ...	14 - 15*	+2	14½—14⅝
213,200	Stk.	Mar. 6	6	6	Hornsey Con. 3½ p.c. ...	122—127	...	...
5,600,000	„	Nov. 21	14	10	Imperial Continental Cap.	212—222	+10	202—220
223,130	„	Feb. 6	3½	3½	Do. 3½ p.c. Red. Deb.	89 - 94	...	...
235,242	„	Mar. 6	8½	8½	Lea Bridge 5 p.c. Ord. ...	170—175	...	...
2,145,907	„	Mar. 6	6	6	Liverpool 5 p.c. Ord. ...	125—126*b*	...	...
245,500	„	Dec. 19	5	5	Do. 5 p.c. Red. Pref. ...	105—115*b*	...	...
306,083	„	Jan. 19	4	4	Do. 4 p.c. Deb. ...	101—103*b*	...	...
165,736	„	Feb. 20	8	10	Maidstone 5 p.c. Cap. ...	180—200	...	...
56,176	„	Dec. 19	3	3	Do. 3 p.c. Deb. ...	70—75	...	...
75,000	£	Dec. 5	†10	†10	Malta & Mediterranean ...	8½ - 10½	...	...
392,000	—	Apl. 1	5½	5½	Metropolitan (of Melbourne) 5 p.c. Red. Deb.	98—103*	...	...
231,978	Stk.	Mar. 6	5	5	M. S. Utility "C." Cons. ...	103—108	...	...
818,657	„	„	4	4	Do. 4 p.c. Cons. Pref.	92—97	...	...
112,126	„	Jan. 9	4	4	Do. 4 p.c. Deb. ...	102—104	...	103½
148,955	„	„	5	5	Do. 5 p.c. Deb. ...	115—120	...	...
675,000	„	21 May '31	†6	†6	Montevideo, Ltd.	35—45	...	...
2,051,315	„	Mar. 6	5	5½	Newcastle & Gateshead Con.	24/8—25/3*d*	...	...
682,856	„	„	4	4	Do. 4 p.c. Pref. ...	100—102*d*	...	...
776,706	„	Jan. 9	3½	3½	Do. 3½ p.c. Deb. ...	90—92*d*	...	...
277,285	„	Nov. 7	5	5	Do. 5 p.c. Deb. '42...	107—109*d*	...	...
274,000	„	Feb. 20	5	5	Newport (Mon.) 5 p.c. max.	99—101*a*	...	...
204,940	„	Mar. 20	7½	7½	North Middlesex 6 p.c. Con.	132—142	...	...
396,160	„	Feb. 6	5	5	Northampton 5 p.c. max. ...	98—103	...	99
300,000	„	Apl. 24	9	7	Oriental, Ltd.	114—119*	−2	...
205,162	„	Dec. 19	8	8	Plym'th & Stonehouse 5 p.c.	155—165	...	...
504,416	„	Feb. 20	8	8	Portsm'th Con. Stk. 4 p.c. Std.	160—165	...	163—165
241,446	„	„	5	5	Do. 5 p.c. max. ...	102—107	...	104—105
114,000	„	Feb. 20	5	5	Preston 5 p.c. Pref.	103—108	...	...
686,312	„	Jan. 23	4	4	Primitiva 4 p.c. Rd. Db. 1911	82—87	...	...
389,813	„	Dec. 19	4	4	Do. 4 p.c. Cons. Deb.	82—87	...	82—84
150,000	10	Mar. 20	6	6	San Paulo 6 p.c. Pref. ...	6⅞—7⅛	...	...
1,736,968	Stk.	Sept. 5	6	6	Sheffield Cons.	122—124*e*	+1	...
95,000	„	Jan. 9	4	4	Do. 4 p.c. Deb.	91—95*e*	...	...
133,201	„	Feb. 20	8½	5	Shrewsbury 5 p.c. Ord. ...	125—130	...	...
90,000	10	June 6	†5	†5	South African	3—5	...	...
6,709,895	Stk.	Feb. 20	5	7	South Met. Ord.	127—130	...	127½—129½
1,135,812	„	„	6	6	Do. 6 p.c. Irred. Pf.	138—143	...	140—141½
850,000	„	„	—	20/-*g*	Do. 4 p.c. Irred. Pf.	100—104	...	...
1,885,445	„	Jan. 9	3	3	Do. 3 p.c. Deb. ...	80—83	...	80½
1,000,000	„	Jan. 23	5	5	Do. 5 p.c. Red. Deb.	114—117	...	115
209,820	„	Mar. 6	8½	8½	South Shields Con.	147½—152½*d*	...	...
1,543,795	„	Feb. 20	6	6	South Suburban Ord. 5 p.c.	124—129	...	127½—128½
300,000	„	„	5	5	Do. 5 p.c. Pref.	113—118	...	115½—117½
868,837	„	Dec. 19	5	5	Do. 5 p.c. Deb.	120—125	...	...
647,740	„	Feb. 20	5	5	Southampt'n Ord. 5 p.c. max.	107—112	...	112
121,275	„	Dec. 19	4	4	Do. 4 p.c. Deb.	100—105	...	...
350,000	„	Mar 6	9/-	5½	Swansea 5½ p.c. Red. Pref.	108—112	...	...
200,000	„	Dec. 19	6½	6½	Do. 6½ p.c. Red. Deb.	105—110	...	...
1,076,490	„	Mar 6	6⅔	6⅔	Tottenham and District Ord.	142—147	...	144½—147
300,000	„	„	5½	5½	Do. 5½ p.c. Pref. ...	123—128	+5	122
62,295	„	„	5	5	Do . 5 p.c. Pref. ...	110—115	...	...
199,005	„	Dec. 19	4	4	Do. 4 p.c. Deb. ...	98—103	...	...
85,701	„	Apl. 3	6	6	Tuscan, Ltd., 6 p.c. Red. Db.	80—85*	...	...
347,769	„	Mar. 6	7	7	Uxbridge, &c., 5 p.ct. ...	140—145	...	143½
88,330	„	„	5	5	Do. 5 p.c. Pref. ...	108—113	...	110
1,322,220	„	Mar. 6	7	7	Wandsworth Consolidated	145—150	...	147—149
1,096,373	„	„	5	5	Do. 5 p.c. Pref.	112—117	...	116—116½
1,317,964	„	Dec. 19	5	5	Do. 5 p.c. Deb.	120—125	...	123—124
158,400	„	Mar. 6	5	6⅄	Winchester W.&G.5p.c.Con.	105—110	...	...

Quotations at:—*a.*—Bristol. *b.*—Liverpool. *c.*—Nottingham. *d.*—Newcastle. *e.*—Sheffield. *f.*—The quotation is per £1 of stock. *g.*—For quarter. *h.*—Paid £3, including 10s. on account of back dividends. *Ex. div. † Paid free of income-tax. ‡ For year.

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CONTRACTS OPEN.

PADIHAM URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

TENDERS FOR COAL.

THE above Council invite Tenders for the Supply of 10,000 Tons of BEST QUALITY GAS SLACK, for delivery (at Padiham Station, L.M. & S. Railway) during the Twelve Months commencing 1st of July, 1933. Supplies will be taken monthly in such proportions as may be arranged with the Council.

Tenders, by letter, sealed and endorsed "Coal," must be delivered to the undernamed not later than May 18, 1933.

No Special Form of Tender is issued.

The Council do not bind themselves to accept the lowest or any Tender.

P. WILLIAMS,
Clerk to the Council.

Council Offices,
Padiham,
April 27, 1933.

BOROUGH OF STOCKTON-ON-TEES.
(GAS DEPARTMENT.)

THE Corporation invite Tenders for the Supply of the undermentioned GOODS during the period of Twelve Months ending 30th June, 1934:

GAS METERS; LIME (Building Quality); CEMENT; LEAD PIPE and COMPO PIPE; BOLTS, NUTS, and RIVETS; CASTINGS.

Specifications and Forms of Tender may be obtained from the Engineer and General Manager, Corporation Gas-Works, Thompson Street, Stockton-on-Tees.

Tenders to be returned to the above, in special envelopes provided, not later than 10 a.m. on Tuesday, the 9th of May, 1933.

The lowest or any Tender will not necessarily be accepted.

THOS. DOWNEY,
Town Clerk.

Borough Hall,
April 25, 1933.

(*Continued on p. 294.*)

ROBERT DEMPSTER & SONS, Ltd., ELLAND, Builders of CARBONIZING PLANTS, both Horizontal and Vertical. Manufacturers of CONDENSERS, PURIFIERS, GASHOLDERS, &c., also every description of COAL and COKE HANDLING PLANT. Telegrams: "DEMPSTER, ELLAND." Telephone: ELLAND 261 (Private Branch Exchange).

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CONTRACTS OPEN.—*Continued.*

BINGLEY URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

TENDERS FOR COAL.

TENDERS are invited for the Supply of 12,000 Tons of GAS COAL over the Twelve Months commencing July 1, 1933.

Further particulars and Forms of Tender may be obtained from the undersigned.

Sealed Tenders on the prescribed Forms, endorsed "Tender for Gas Coal," must be delivered on or before Twelve noon Monday, the 8th day of May, 1933, addressed to H. O. Hilary, Esq., Clerk to the Council, Myrtle Grove, Bingley.

The Council do not bind themselves to accept the lowest or any Tender.

J. B. BALMFORTH, A.M.I.M.E.,
Engineer and Manager.

Gas-Works,
Bingley.

CITY OF PLYMOUTH.
(GAS DEPARTMENT.)

TENDERS are invited for the Installation of One WATER TUBE CONDENSER, to deal with 1,500,000 c.ft. of gas daily. Specifications available on application to the undersigned.

Tenders, endorsed "Condenser," to be delivered not later than 10 a.m. on Tuesday, May 23, 1933, to the Town Clerk, Municipal Buildings, Plymouth.

(Signed) F. BLACKBURN, A.M.Inst.C.E.,
Engineer and General Manager.

Gas-Works,
Devonport.

CITY OF BIRMINGHAM.

THE City of Birmingham Corporation are prepared to receive TENDERS for the Supply and Delivery of STORES, as set forth below, for a period of Twelve Months from July 1, 1933.

Conditions of Contracts and Forms of Tender may be obtained on application as follows:

To the SUPERINTENDENT ENGINEER, BATHS DEPARTMENT, Woodcock Street, Birmingham, for:

Schedule No.
1.—TOWELS, DUSTERS, and SCOURERS.

To the SECRETARY, ELECTRIC SUPPLY DEPARTMENT, Dale End, Birmingham, for:

Schedule No.
2.—FILES, HACK SAW BLADES, and ENGINEERS' TOOLS.
3.—BELTING—BALATA and LEATHER.

To the GENERAL MANAGER AND SECRETARY, GAS DEPARTMENT, Council House, Edmund Street, Birmingham, for:

Schedule No.
4.—LEAD (Red and White), LINSEED OIL, &c.
5.—SHEET GLASS.
6.—SASH CORD, ROPE STRING, & TARRED YARN.
7.—CLOGS.
8.—GAS MANTLES.

To the CITY ENGINEER AND SURVEYOR, Council House, Birmingham, for:

Schedule No.
9.—HAMMER HEADS, SHOVELS, FORKS, &c.
10.—BUCKETS, WATERING CANS, PAINT KETTLES, OIL BOTTLES, and RIDDLES.
11.—PAINT and other BRUSHES.
12.—ROAD WATCHMEN'S LAMPS.
13.—BROOMS, MOP STAILS, FILE HANDLES, HAMMER, SLEDGE, and PICK SHAFTS.

To the GENERAL MANAGER, TRAMWAYS AND OMNIBUS DEPARTMENT, Council House, Congreve Street, Birmingham, for:

Schedule No.
14.—SCREWS and COTTER PINS.
15.—DRYSALTERY.
16.—LEATHERS and SPONGES.
17.—COTTON WASTE.

The Tenders must be enclosed in a sealed cover, addressed as directed in the General Conditions, and delivered not later than Saturday, May 13th, 1933.

COUNTY BOROUGH OF DEWSBURY.
(GAS DEPARTMENT.)

SAVILETOWN GAS-WORKS, DEWSBURY.

TENDERS are invited for the Supply and Delivery, by rail at the Corporation Sidings (L. & Y. Section), L.M.S. Railway, Dewsbury, or by road, at the Gas-Works, of 24,000 Tons of GAS COAL and SLACKS during the Year ending the 31st of October, 1934.

Further particulars and Forms of Tender may be obtained from Mr. H. L. Bateman, Engineer and Manager, Gas-Works, Saviletown, Dewsbury.

Sealed Tenders, on the prescribed Forms, endorsed "Tenders for Coal," must be delivered at my office not later than Thursday, the 11th of May, 1933.

The Corporation do not bind themselves to accept the lowest or any Tender.

HOLLAND BOOTH,
Town Clerk.

Town Hall,
Dewsbury,
April 26, 1933.

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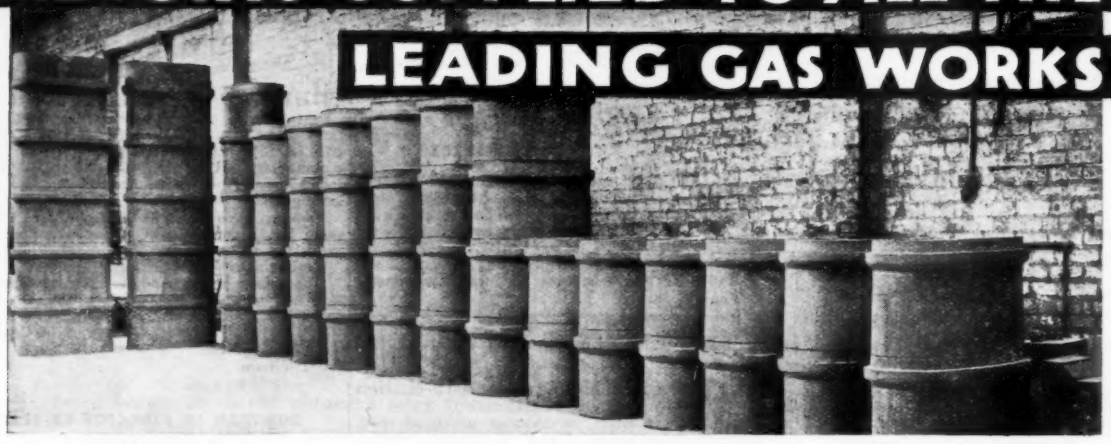

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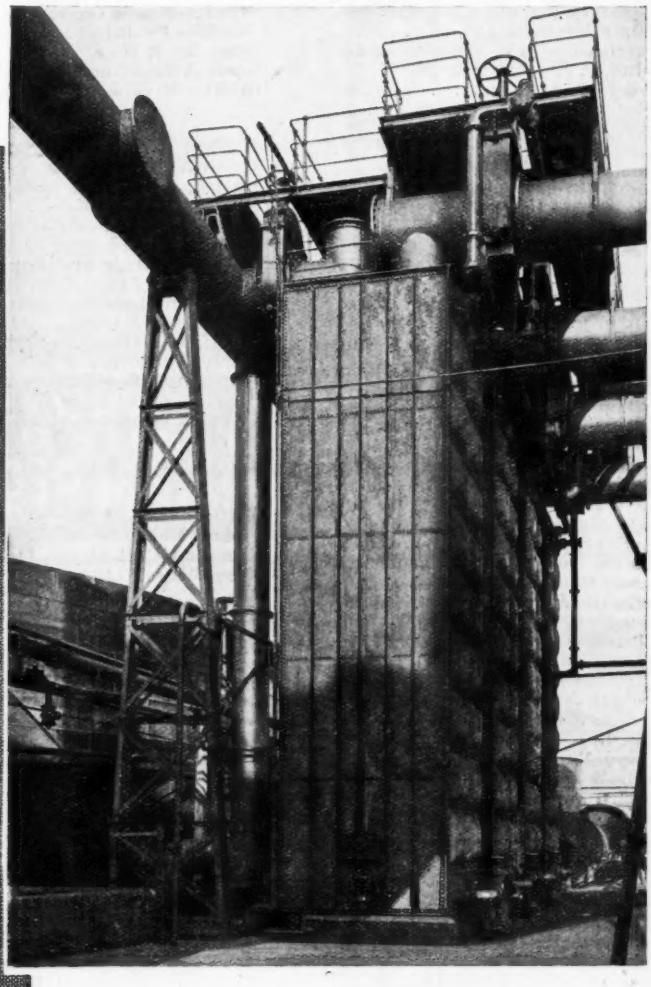

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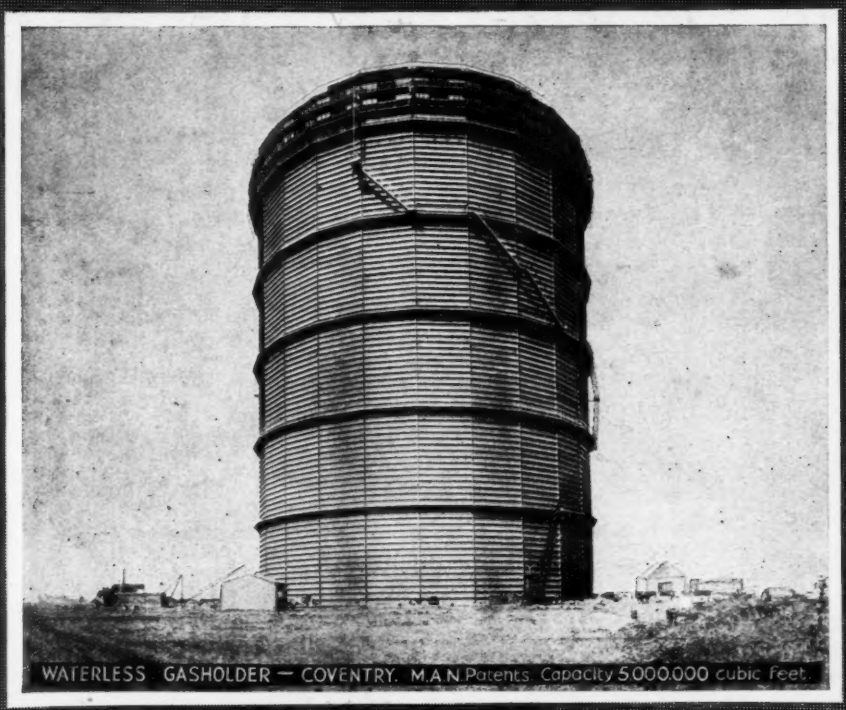

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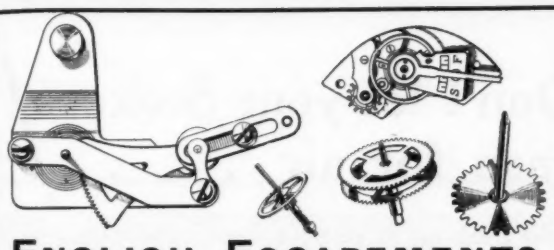

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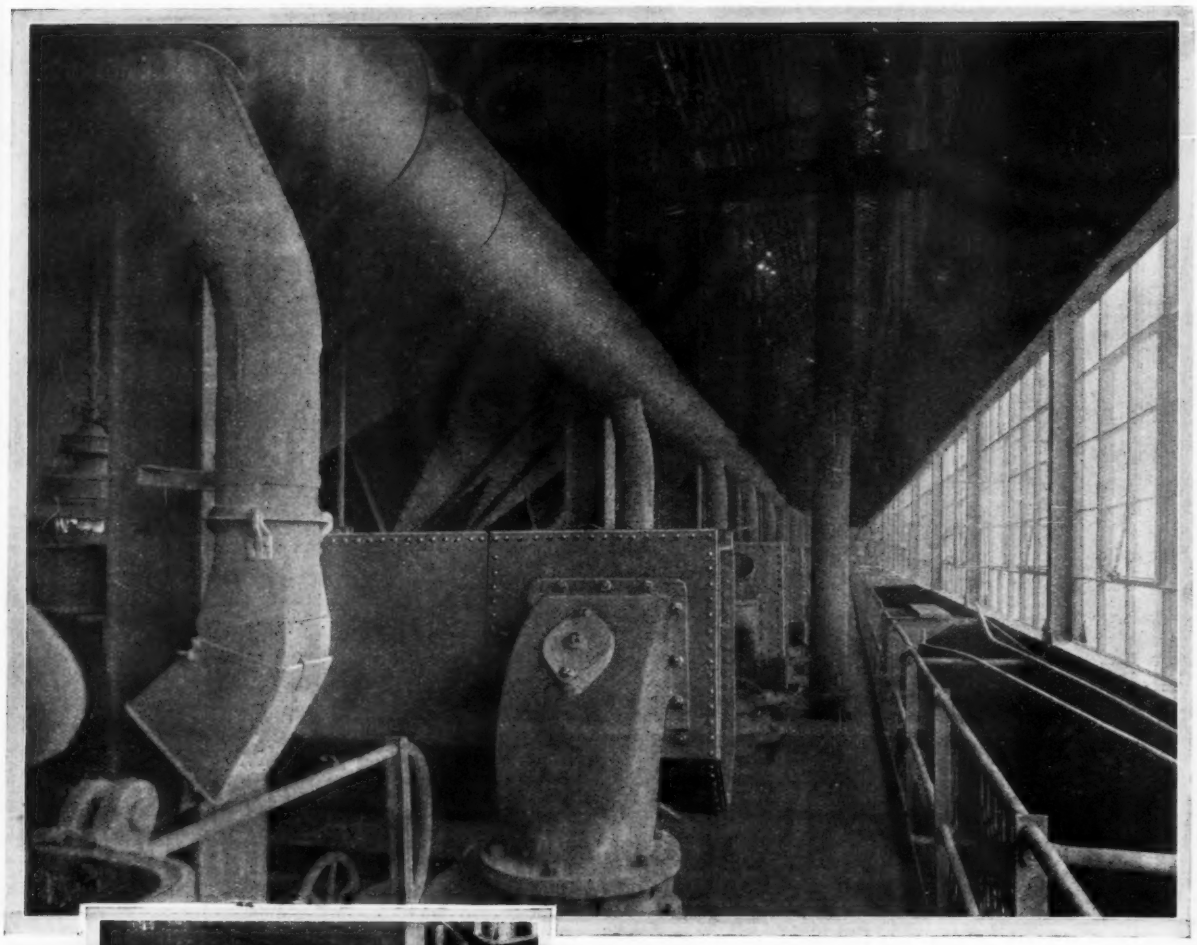
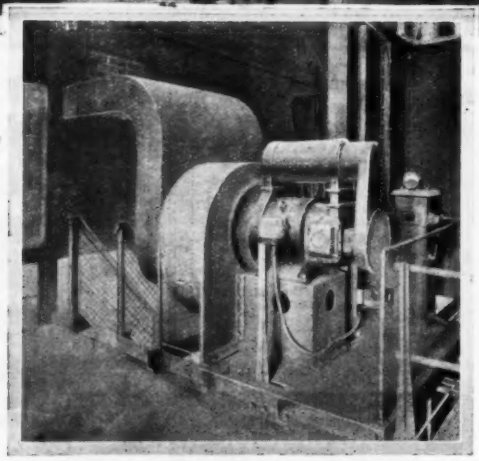


Part of the "Keith-Blackman" Cold Air Douche Plant in one of the Vertical Retort Houses of the Nine Elms Works of the Gas Light & Coke Co.



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We invite enquiries from all Gas Executives who are interested in this subject.

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